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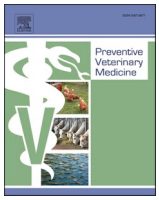

Dutch dairy farmers' perspectives on culling reasons and strategies

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ABSTRACT

Since the abolishment of the milk quota system in Europe in 2014 and the introduction of environmental policies such as the phosphate rights system in the Netherlands, the reasons for culling dairy cows might have changed. The aim of this study was to determine the culling reasons for dairy cattle and to identify farmers' culling strategies and their intentions regarding the alteration of indicated culling strategies. To this end, an online questionnaire was distributed among dairy farmers nationally that resulted in 207 responses. Results showed that the most frequent culling reasons were related to problems with reproduction, udder, and hoof health. Primiparous cows were primarily culled for miscellaneous reasons such as injury, reproduction failure, and low milk yield. Multiparous cows were culled predominantly for reproduction failure, udder health and hoof health reasons. Most respondents indicated that they consider formulating a culling strategy, based on certain rules of thumb regarding the most common reasons for culling. Most farmers also reported that culling decisions on their farms were perceived to be unavoidable, though reproductive culling decisions are primarily voluntary. Most respondents stated that they intended to reduce the culling rate for better economic gain did not intend to alter the amount of replacement stock reared. The applied rules of thumb regarding culling strategies do not seem to have changed since the policy changes in dairy farming. The question remains whether farmers' rules of thumb might have made them unaware of the actual economic consequences of their culling strategies under the altered situation.

1. Introduction

Culling and replacement of dairy cattle have an impact on the economic performance of dairy farms. According to Fetrow et al. (2006), culling is either biologically or economically driven. Biological culls refer to those cows for which a productive future is absent due to serious physical disorders such as permanent infertility or irreparable injuries. In these cases, the decision to cull is actually forced on the farmer. Economic culls refer to those cows for which replacing them is considered a smart economic option for the dairy farm. Fetrow et al. (2006) argued in favour of using this distinction between biological versus economic culling and against using the traditional distinction between voluntary and involuntary culling. Few studies have investigated the specific reasons for culling behind the decisions made by dairy farmers in recent years (reviewed by Compton et al., 2017; De Vries and Marcondes, 2020). In general, reproductive fitness, poor udder health and hoof disorders or lameness were found to be the main causes of culling cows. However, the specific reasons differed between countries

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(Heise et al., 2016; Kerslake et al., 2018; Gussmann et al., 2019; Rilanto et al., 2020; Dallago et al., 2021).

Various studies have observed that when deciding to cull a cow, multiple reasons may come into play whereas often in practice only one reason is recorded in national animal registration databases (De Vries and Marcondes, 2020). This restricts further insights into the complexity of culling management. Moreover, it was noted that the reasons for culling primiparous and multiparous cows may differ. Whereas the primiparous cows are often culled for udder non-conformity, lack of production, injury or behavioural issues, multiparous cows are culled for more systematic reasons such as poor reproductive performance, udder and hoof health (Gussmann et al., 2019).

In the past, Boer et al. (2013) reported the most frequent reasons for culling in the Netherlands as being similar to those found in other countries. However, since the introduction of environmental policies such as the phosphate rights system in the Netherlands, the importance of reducing the number of young stock has increased and consequently, culling decisions may have been changed. The reasons behind dairy cattle culling followed by Dutch dairy farmers in the new policy climate have not been investigated or documented.

Since the majority of cows culled by dairy farmers are for "economic" reasons (Fetrow et al., 2006), it might be the case that farmers follow specific plans or strategies for making such decisions. Beaudeau et al. (1996) indicated that having a specific culling plan or strategy was part of general management practices as applied by French farmers and that these plans differed significantly between the farmers depending on their "style". Contrary to that, Bergeå et al. (2016) found in their survey that multiple Swedish farmers felt that their culling decisions were unavoidable or "forced" and hence did not permit a decision space to adopt a specific culling strategy. Previous studies investigated the link between culling magnitude (culling rate) and farm-specific characteristics (Alvåsen et al., 2012, 2018; Nor et al., 2014; Han et al., 2022; Kulkarni et al., 2023) but these associations did not completely explain the variation in culling magnitudes or reasons for culling between different farms. Nor et al. (2014) pointed out that the majority of studies on culling reasons focus on the performance of individual cows whereas the farmer's style, culture and individual herd management might play a role in culling decisions as well. Dairy farmers might use rules of thumb as proxies for their culling strategies.

Furthermore, culling decisions are intimately linked with the longevity of dairy cows (Dallago et al., 2021). Currently, improved longevity is favoured by most dairy-producing countries (Hadley et al., 2006; Bell et al., 2011; Schuster et al., 2020). Consumers are pushing for dairy farming practices where cows are bred and reared more "naturally" (Spooner et al., 2014). Countries like the Netherlands have introduced new environmental policies such as phosphate regulation in 2018 which are aimed at improving the sustainability of dairy farms. Therefore, to improve the longevity of dairy cows, efficient management and culling are important (Schuster et al., 2020). Han et al. (2022) discovered that longevity on farms could be improved without impacting herd performances to a large degree. Further research into the perspectives behind the culling strategies of dairy farmers, and their intentions to alter these strategies in near future is needed. Such insights can add to the discussion of improving cattle longevity in the future. Therefore, the aim of this study was to (1) determine the reasons behind the culling of cattle on Dutch dairy farms, (2) to determine whether Dutch dairy farmers follow specific culling strategies (plan) and (3) if so, to evaluate whether they intend to change their strategies in the near future.

2. Materials and methods

2.1. Questionnaire

Data on culling reasons, strategies and future intentions were collected from Dutch dairy farmers by means of an online questionnaire. The link to the survey was distributed to farmers who subscribed to the online monthly newsletter of Royal GD, called 'Actueel Rund' (Royal GD, 2021). This newsletter was sent to around 12,000 Dutch dairy farmers, or approximately 80% of the total number of Dutch dairy farms (CBS, 2021). Respondents could voluntarily participate in the study by completing the survey. Responses were collected between 9th December 2021 and 10th January 2022. To enhance participation, farmers were incentivized by the chance of winning one of twenty €25 gift cards. The study protocol and consent procedure complied with the Netherlands Code of Conduct for Scientific Practice and were approved by the Social Sciences Ethics Committee of Wageningen University (CoC number 09131098). For participation in the gift card raffle, email addresses were provided by the responding farmers voluntarily. This private information was stored separately from the data of the questionnaire. The contact details and IP addresses of the respondents were masked and were unavailable to the research team. The cover letter part of the survey contained a summary of the research intent along with a privacy and data management statement.

Throughout the survey, culling was defined as the removal of cows to the slaughterhouse excluding sales to other farms, natural death, or euthanasia on the farm, for the sake of consistency. The body of the questionnaire consisted of four parts. The questions in the first part (n = 11) related to the most recently culled cows on the respondent's farms. Questions such as if they remembered the most recently culled cow (yes/ no), time of deciding when to cull (in terms of stage of lactation of the cows; multiple choice), whether it was an unforeseen culling (unforeseen defined as <1 week between the decision to cull and actual culling; yes/ no), and the reasons for culling (multiple choice with multiple answers) were asked. These questions were duplicated for primiparous (1st parity) and multiparous (> 1 parity) cows.

The second part consisted of questions about the culling strategies of respondents (n = 8), if present. Respondents were asked to state their three most frequent and least frequent occurring culling reasons (multiple choice with rank). A series of four statements were asked to be rated on a 5-point Likert scale, ranging from "totally disagree" to "totally agree", to identify the use of a culling strategy. For example, "I have a clear long-term culling plan on my farm" was one of the statements. If the response was positive, additional questions regarding rules of thumb or guidelines for culling decisions were explored.

The third part consisted of statements and questions (n = 5) regarding the intentions of the respondents to alter their existing culling strategy. For example, "I intend to alter the percentage of culled cows in the next year" was one of the statements. The possible positions for this statement were "Yes, I will decrease…", "Yes, I will increase…" or "No, I don't intend to…" (multiple choice). Depending on the response, an additional question (multiple choice) was posed to address the motivation of the respondent behind the indicated intentions.

In the fourth part of the questionnaire, general questions (n = 14) about the characteristics of the farm/ herd and the farmer were asked. In terms of information on herd size and the number of current young stock, respondents were given the option to provide their herd ID which would allow the automatic collection of entry/exit data for the animals from the Netherlands Enterprise Agency (RVO), which is a government entity that collects such data. Of those respondents who consented to this option, automatically received data was anonymized by Royal GD before being integrated with the survey questionnaire responses due to potential privacy concerns.

Before distribution, the survey was pilot tested on four farmers and relevance, estimated duration of completing the survey and difficulties encountered while filling out the survey were investigated. We conducted unstructured face-to-face interviews with these farmers for feedback regarding the relevance of the questions and the perceived meaning of the questions as they appear in the survey to avoid ambiguity and confusion in the interpretations by the responding farmers. The full survey can be viewed in Appendix A: Questionnaire.

2.2. Data editing

Responses were checked for missing data in all four parts of the survey questionnaire. In addition to that, responses were checked for illogical entries (for example, herd average 305-day milk production of 100,000 kg) and these responses were recoded as missing values. From the answers in the responses, numerical and categorical variables were generated for descriptive analyses (Table 1, Table 2). Secondary variables such as self-reported culling rate (ratio of the number of cows culled to rolling herdsize including milking and dry cows in the year of the survey) and farm intensity (ratio of the number of producing cows including milking and dry cows to the area of farmland in hectares) were generated from the responses. All steps of data editing and further analyses were conducted in R statistical package 3.6.3 ('R Core Team, 2020).

2.3. Descriptive analyses

Summary tables of numerical variables were generated including median, minimum, maximum, mean, standard deviation and the number of responses. Categorical variables were summarized by the number of categories and the proportion of answers per category.

3. Results

3.1. Response to Survey

In total, 207 responses were recorded between 9th December 2021 and 10th January 2022. Considering that the newsletter was sent to approximately 12,000 dairy farmers, the response rate of the survey was less than 2%. Of these 207 responses, 201 responses were finally used in the analyses of this study. Of these 201 responses, 72 respondents completed the full survey, while 55% of the 201 responses had complete answers in at least three out of four parts of the survey questionnaire. 47 respondents consented to using their ID information for retrieving herd size statistics from the RVO database. Of these, 46 were retrieved (1 had a possible error in the ID provided), anonymized, and integrated into the database.

Table 1
Descriptive summary of categorical variables based on the responses from dairy farmers to the questionnaire.

Variable	N[a]	Levels/ Categories	Counts (n[b])	Per cent (%)
Age of farmer in years	116	18–35 years	46	39.7
		36–55 years	39	33.6
		> 55 years	31	26.7
Type of farm	116	Conventional	108	93.1
		Organic	5	4.3
		Other	3	2.6
Type of milking system	116	AMS (Automatic Milking System)	33	28.5
		CMS (Conventional Milking System)	83	71.5
Avg. age at first calving	115	20–24 months	75	65.2
		25–27 months	39	33.9
		28–32 months	1	0.9
Decision responsibility	74	Yes	45	60.8
		Partly	29	39.2
		No	0	0.00
Replacement stock type	115	I breed and rear my own replacement stock	90	78.3
		I breed my own replacement stock; however I also purchase replacement animals	9	7.8
		My own bred replacement stock is reared on another location by someone else and will be back on my own farm as heifers	13	11.3
		my own bred replacement stock is reared by someone else, and I purchase replacement animals	1	0.9
		I purchase all my replacement stock	2	1.7

[a] N = Number of responding farmers
[b] n = number of answers by responding farmers

Table 2
Descriptive summary of numeric variables based on the responses from dairy farmers to the questionnaire.

Variable	N[a]	Mean (SD)	Min	Median	Max
Avg. herd age (months)	112	64.5 (10.7)	49	63	99
Number of milk-producing cows	109	146 (80)	31	126	536
Number of heifers (1–2 years of age)	109	32 (24)	0	27	150
Number of female calves (0–1 years of age)	109	37 (22)	3	33	106
Number of culled milk-producing cows (excluding dairy sale)	108	21.9 (19.7)	1	16	150
Number of purchased heifers (per year)	109	2 (6)	0	0	37
Farm intensity[b]	104	2.39 (1.16)	0.833	2.13	10.7
Avg. 305-day milk production in Kgs	112	9,341 (1385)	5,700	9,400	12,500
Avg. self-reported culling rate[c]	108	0.15 (0.10)	0.004	0.14	0.73

[a] N = Number of responding farmers
[b] Farm intensity = milk-producing cows/ area in hectares
[c] Culling rate = ratio of number of culled cows (excluding dairy sale) to number of producing cows in the herd per year

3.2. Descriptive statistics

Table 1 shows that 73% of the respondents were below the age of 55 years old. Also, 61% of the respondents were completely responsible for the culling decisions made on their farms. Most of the respondents had a conventional farming system, and 28% of the respondents had an automatic milking system (AMS). 78% of the respondents adopted a closed farming system where they breed and rear their own replacement heifers, while 12% of the respondents had an arrangement with other farmers for rearing their replacement stocks. Roughly two-thirds of respondents of the farms had an average first calving age between 20 and 24 months.

From Table 2, it can be seen that the average dairy herd size of the responding sample population was 146 cows (SD 80) and the average age of cows in the dairy herd was 5 years and 5 months (64.5 months; SD 10 months). The average number of calves and heifers reared on the respondent's farms accounted for roughly 25% and 22% of the average number of producing cows (herd size), respectively. The self-reported culling rate, which excluded the dairy sale of cows (sold alive), was on average 15% (SD 10%). Based on the reported farm area in hectares (mean approximately 61 ha, SD 28 ha; are not shown in Table 2), the mean farm intensity on the responding farms was 2.39 dairy cows per ha (SD 1.16 dairy cows per ha). All numerical variables, except herd average 305-day milk production in kilograms, were not normally distributed.

A summary of responses regarding recently culled cows distributed by the parity group can be seen in Table 3. From the primiparous category, most respondents reported culling cows for reproduction issues (27.1%, N = 35 of 99) followed by other reasons (20.9%, N = 27 of 99). The other reasons included self-reported explanations such as postpartum complications, injuries and trauma or were labour related. In the

Table 3
Parity groupwise summary of recently culled cows on the responding farms.

Factor	1st parity		> 1 parity	
	Count	%	Count	%
Culling reasons[a]	N = 99; n = 129		N = 131; n = 181	
Reproduction	35	27.1	57	31.5
Somatic Cell count/ Mastitis	14	10.9	37	20.4
Hoof health/ Lameness	13	10.1	39	21.5
Low Milk yield	17	13.2	15	8.3
Reducing herd size	2	1.7	13	7.2
Udder defects/ Conformity	6	4.5	0	0
Aggression/ Undesirable Behaviour	15	11.6	2	1.1
Others	27	20.9	18	10
Foreseen/Unforeseen[b]	N = 98		N = 133	
Foreseen	58	59.2	96	72.2
Unforeseen	40	40.8	37	27.8
Culling decision time	N = 84		N = 83	
After Calving	23	27.4	23	27.7
After Insemination	12	14.3	11	13.3
After Unsuccessful treatment	27	32.1	27	32.5
Others	22	26.2	22	26.5
Number of reasons reported	N = 99		N = 131	
Only 1 reason	75	75.7	91	69.5
2 reasons	18	18.2	33	25.2
3 + reasons	6	6.1	7	5.3

[a] N = number of responding farmers; n = number of answers (multiple answers to the question allowed per respondent)
[b] Question of whether this culling decision was made in < 1 week (unforseen) or > 1 week (forseen) before actual culling date

case of multiparous cows, the most common reasons for culling were related to reproduction (N = 57 of 131), poor hoof health (N = 39 of 131) and high somatic cell count or the presence of mastitis (N = 37 of 131). Most responding farmers reported only one main reason for culling, while some reported two and rarely three reasons for each parity group (Table 3). Less than half of culling decisions were considered unforeseen by the farmer irrespective of the parity of the cow. Also, it was clear that most farmers decided to cull cows after attempting to treat them, irrespective of the age of the producing cow.

From Fig. 1, the most frequent culling reasons as indicated by the responding farmers were related to reproduction problems or issues, somatic cell count or the presence of mastitis and hoof health issues or lameness. On the other hand, the least frequently occurring culling reasons were the availability of a replacement heifer, behavioural issues,

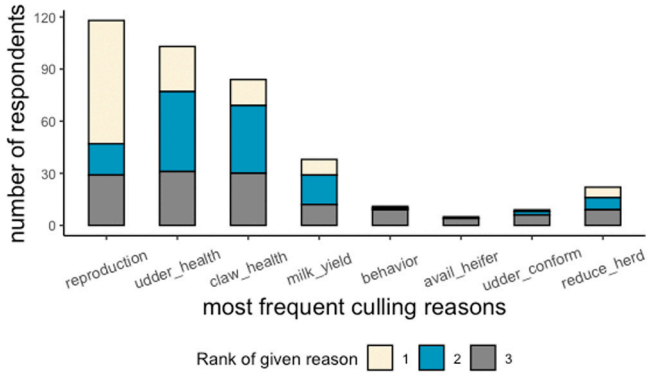

Fig. 1. ..Farm specific top 3 most frequent culling reasons reported by the responding farmers.
Note: X axis glossary: reproduction = reproductive issues, udder_health = udder health issues/
SCC, claw_health = hoof health issues/ lameness, milk yield = low milk yield, behaviour =
behavioural issues/ aggression, avail_heifer = availability of suitable replacement heifer.
udder_conform = udder conformation issues, reduce_herd = reducing herd size.
Note: N = 130 (number of responding farmers).

and conformity of the udder. The top three most frequent reasons coincided with the top reasons reported for a recently culled cow in Table 3.

As indicated by Fig. 2, the majority of responding farmers indicated that they have a clear long-term culling plan (72.8%) and follow specific rules of thumb regarding culling decisions (agreement = 61.7%). Also, the majority of responding farmers (55.5%) believed that their culling strategy is optimal. Most respondents (80.2%) also reported that the culling decisions on their farm were unavoidable. Of those farmers who agreed with the statement that they have specific rules of thumb for culling, 22 (12%) responded that they use the same rule of thumb for primiparous and multiparous cows (Table 4). In general, most rules of thumb were related to reproduction, udder health (somatic cell count or mastitis) and hoof health (lameness).

Table 5 shows, that the majority of responding farmers (62.4%) had no intention of altering their primiparous cow culling strategy soon. Similarly, most of the responding farmers (53.5%) had no intention of altering their multiparous cow culling strategy. Also, 56.9% did not intend to alter the amount of young stock that they kept for replacement. However, 64.7% of the respondents agreed that they wished to reduce the culling rate on their farms. In the follow-up question on their motivation behind the preference of reducing the culling rate, 37.2% of these respondents indicated improving the economic results on their farms as motivation, 29% indicated improving the longevity of their cows and 15.2% indicated improving the environmental sustainability.

4. Discussion

The main purpose of this study was to survey Dutch dairy farmers regarding their culling decisions. We asked farmers about their most recently culled cows, as recent events are easier to remember. Moreover, by referring to these recent cases, we avoided socially desirable answers to questions regarding culling reasons. This method was the same as the method employed by Robbers et al. (2021) to study colostrum management of Dutch dairy farmers. In addition to the most recently culled cows, we asked about the most and least frequent culling reasons on the farm to detect if the recent events were in line with the general situation.

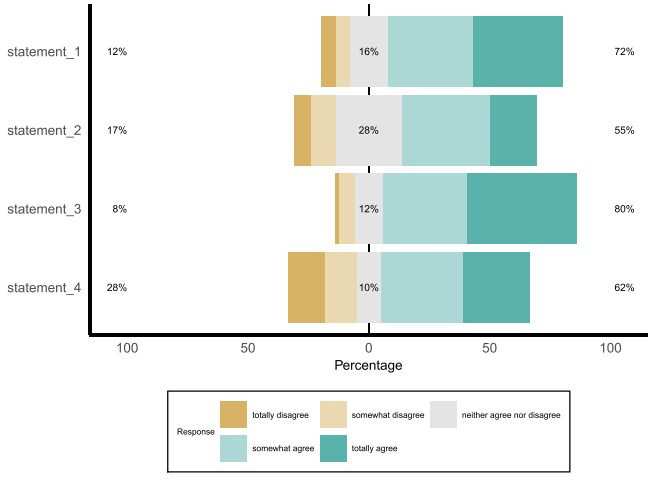

Fig. 2. Likert scale graph of responses to strategy statements. Note: Glossary of statements.
Statement_1 = "I have a clear long-term culling plan on my farm".
Statement_2 = "I consider the culling strategy on my farm to be optimal".
Statement_3 = "The culling decisions I make are unavoidable".
Statement_4 = "When deciding to cull a cow, I follow specific rules of thumb/ guidelines".
Note: percentages on extreme left and right indicate the total percentage of those who disagree (totally + somewhat) and those who agree (somewhat + totally) respectively.

Table 4
Specific rules of thumb/ guidelines graph followed by responding farmers to make culling decisions.

General Criteria for specific rule of thumb	For primiparous cows		For multiparous cows	
	n[a] = 156	%	n[a] = 187	%
Reproduction	56	36	51	27
Udder health	36	23	46	25
Claw health	18	12	36	19
Milk production	21	13	21	11
Breeding value	3	2	0	0
Body conformation	4	3	3	2
Other	18	11	8	4
Same rules as primiparous cows	-	-	22	12

(Number of respondents = 85)
[a] n = number of answers by respondents (multiple answers allowed per response)

Table 5
Summary of responses reported on Intention statements by responding farmers.

	Intention Statements	Number of responses	Percentage (%)
1	"I intend to alter my culling strategy for primiparous cows" (N = 117)		
	Yes, I will cull primiparous cows more quickly	0	0.0
	No, I don't want to alter my strategy	73	62.4
	Yes, I will cull primiparous cows less quickly	44	37.6
2	"I intend to alter my culling strategy for multiparous cows" (N = 116)		
	Yes, I will cull multiparous cows more quickly	7	6
	No, I don't want to alter my strategy	62	53.5
	Yes, I will cull multiparous cows less quickly	47	40.5
3	"I intend to alter the percentage of culled cows in the next year" (N = 116)		
	Yes, I will increase the percentage of culled cows	5	4.3
	No, I don't intend to alter this percentage	36	31
	Yes, I will decrease the percentage of culled cows	75	64.7
4	"I intend to alter the amount of replacement stock in the next year" (N = 116)		
	Yes, I will increase the amount of replacement stock	25	21.5
	No, I don't intend to alter this amount	66	56.9
	Yes, I will decrease the amount of replacement stock	25	21.5

Based on the descriptive analyses, Dutch farmers cull their cows mostly for health reasons such as problems with reproduction, udder health issues and lameness. These findings were similar to the findings of Boer et al. (2013) who investigated the main reported culling reasons in the Netherlands during the years 2011–2012, before the abolition of milk quotas and the implementation of environmentally driven policies. This was also consistent with previous studies performed in other countries (Heise et al., 2016; Kerslake et al., 2018; Gussmann et al., 2019; Rilanto et al., 2020; Workie et al., 2021). Responding farmers tended to cull cows mostly after attempting treatment or after parturition. This finding was consistent with the findings reviewed by Beaudeau et al. (2000). Previous literature suggested that farmers might cull cows for multiple reasons (De Vries and Marcondes, 2020). However, despite the opportunity to report multiple reasons for culling, the majority of respondents in this study reported only one reason for culling. It is possible that dairy farmers perceive one primary reason for culling along with other less important factors. Besides this, the majority of the respondents also indicated that they have a clear long-term culling plan and that they consider their culling decisions to be optimal. The majority of the respondents indicated that they intended to reduce the culling rate on their farm in the near future, mostly for economic gains and to improve the longevity of cows in the producing herd but did not intend to alter the amount of young stock maintained for replacement.

In the survey, we asked farmers for culling reasons which excluded permanent health issues, natural death, or euthanasia which form biological culling as defined by Fetrow et al. (2006). However, forced culling decisions such as due to infertility might have been included in the responses to the study under culling reasons "issues related to reproduction" and could not be easily separated from "economic culling reasons". Regardless of this, the survey was based mostly on "economic culling reasons" (per Fetrow et al., 2006 definition), wherein the farmer had the agency to make the culling decisions. However, the majority of farmers responded that they found their culling decisions to be unavoidable. Considering these responses, we theorized that although farmers have a culling plan in place, they perceive a lack of decision space for making rational economic decisions. This finding was consistent with the findings of Bergeå et al. (2016) in Swedish dairy herds. So, within the perspectives of Dutch dairy farmers, the ambiguity within which decisions are voluntary (economically driven) and which are involuntary (forced) still exists. For example, culling for health reasons such as clinical mastitis might be forced and biological in nature or might be economic when the farmer has a chance to decide to treat the diseased cow for a longer duration. Or, when culling due to reproductive reasons, infertility can be a forced decision whereas culling due to reproductive failure after a fixed number of inseminations can be viewed as economic. A recent study has shown that it is possible to increase the longevity of Dutch dairy cows but that can lead to a higher mortality rate, a higher bulk milk somatic cell count and a higher antimicrobial use (Bisschop et al., 2023). Advisors to the farmers need to be aware of this perception and the fact that although most culling decisions might be economic in nature, they should be balanced for health, welfare and use of antimicrobials in the herd.

Indicated rules of thumb corresponded to the most frequent culling reasons. Since the culling reasons reported by farmers have not changed in the new policy environment, it seems that the rules of thumb followed by farmers have remained the same. This may have been caused by the nature of rules of thumb that may be linked to cognitive anchors. Such cognitive anchors could result in conservatism, indicating the tendency to revise initial beliefs insufficiently in new decision situations (Tversky and Kahneman, 1974). Hence, it is important for farmers and their advisors to be aware of this potential pitfall of conservatism within common rules of thumb and constantly evaluate the effectiveness of these rules of thumb and the associated culling strategy (Radke and Lloyd, 2000). This is especially important when farming circumstances change, such as the implementation of the phosphate legislation in the Netherlands.

In terms of the response rate, out of 12,000 subscribers to this newsletter, only 207 (less than 2%) did participate in the survey. Of these, only 71 farmers completed the whole survey. This low response rate can be attributed to the fact that the target population was not actively invited but rather had to opt into participation. We also do not know how many farmers actively read the newsletter.

Most of the respondents were relatively young farmers between the ages of 18–55 years. This was in contrast to the national statistics where most farmers were older and above the age of 55 years (Beldman et al., 2020). This was also reflected in the fact that 40% of the respondents were not completely responsible for the culling decisions (Appendix B: Figure B.1). This indicated that there was a selection bias in this study. One possible explanation for this could be the fact that the survey was sent out through an online newsletter whereas the older farmers might prefer a printed version of the newsletter. A result of this deviation from the national average might result in bias in the views reported by the farmers. For example, younger farmers might show more readiness to change their culling strategy and adjust their replacement stock quantities. Another consequence might be that since some of the reporting farmers were young and not completely responsible for the culling decisions (see Table 1; Decision responsibility variable), the views

expressed by this group might represent the future perspectives of dairy farmers. Future surveys on this subject could be presented in printed postal forms or through focus groups to avoid selection bias in age of target population.

Moreover, the self-reported herd size mean of the responding farmers was 146 cows compared to the national average herd size of 106 indicating that the participating farms were of larger size (CBS, 2021). The average intensity of the responding farms was 2.39 dairy cows per ha which was slightly higher than the national average intensity of 1.77 cows per hectare in 2021 (CBS, 2021). The majority of the herd average age at first calving reported (20–24 months) was also lower than the national average of 26 months. These comparisons suggested that the responding farmers might have more intensive farms compared to the overall situation in Dutch dairy farms. This deviation from the national average could mean slightly different perspectives on culling compared to the general situation in the Netherlands. The self-reported culling rates by the responding farmers had a mean of 15%. This figure was excluding the sale of animals to other farms and death or euthanasia on the farm. Considering the exclusion, which accounts for about 5% of all dairy culling, the reported culling rate was comparable to the culling rate of 2021 which was 22% (CBS, 2021). Therefore, although the sample means for herd size and farm intensity in respondents were different from national data, the overall culling rate was representative of the current Dutch dairy farming situation.

5. Conclusion

In general, this study provided insights into the perspectives of dairy farmers regarding the culling decisions (reasons and strategies) that they make on the farm. As such, the responding farmers did have the intention to alter the culling rate on their farms for improving the economic gains and the longevity of cattle on their farms. The perceptions regarding the main culling reasons and strategies seem to not have changed since the implemented policy changes that have imposed additional production restrictions. Given the altered production circumstances, the question remains whether not changing the culling reasons and strategies results in economically beneficial decisions for the farmers. It is, therefore, important that farmers and their advisors are aware of this and regularly evaluate the economic effectiveness of applied culling reasons and strategies while taking the health and well-being of the herd into account.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi: 10.1016/j.prevetmed.2023.105997.

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