



Implementation of compact calving at the farm level: A qualitative analysis of farmers operating pasture-based dairy systems in Ireland

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ABSTRACT

Pasture-based dairy systems aim to maximize the proportion of grazed pasture in the cow's diet by having a compact calving season that coincides with the onset of the grass growing season. In Ireland, where pasture-based systems are dominant, a key performance indicator that reflects the degree of compact calving is referred to as 6-wk calving rate (6-wk CR). Although the industry target is 90%, the national average 6-wk CR in Ireland is currently 67%. The aim of this study was to use qualitative research to understand in depth farmers' experiences in implementing a high 6-wk CR. Ten case-study dairy farmers were interviewed using the biographical narrative interpretive method. We identified 5 broad and often interrelated themes evoked by farmers regarding 6-wk CR: the "good" farmer; support networks; free time and family time; simplicity of a structured system; and profitability and monetary gain. The findings of this study identify complexities and challenges at farm level when it comes to increasing 6-wk CR, such as increased workload and challenges associated with large numbers of male calves born during a condensed calving season. Benefits experienced by farmers as a result of increasing 6-wk CR included increased days in milk and consequently improved cash flow as well as increased grass utilization. Our findings are of interest to researchers and extension agents involved in programs concerned with reproductive management in pasture-based dairy systems.

Key words: compact calving, pasture-based, extension, qualitative

INTRODUCTION

The imagery of cows grazing is still widely associated with dairy farming (Shortall, 2019), representing the "ideal dairy farm" (Cardoso et al., 2016). Yet, globally, pasture-based dairy farming is declining (Britt et al., 2018; van den Pol-van Dasselaar et al., 2020). Nonetheless, there are exceptions to this decline with countries such as New Zealand, Australia, Ireland, the United Kingdom, and France being synonymous with pasture-based dairy production (Roche et al., 2017). In these systems there is a strong focus on maximizing the proportion of the grazed pasture in the diet of lactating dairy cows (O'Donovan et al., 2021) due to its association with increased profitability (Ramsbottom et al., 2015). From an economic perspective, this low-cost system provides a competitive advantage compared with countries predominantly practicing confined dairy production systems (Läpple et al., 2012).

To capitalize on this competitive advantage, an essential component of managing seasonal calving herds is the synchronization of pasture supply with pasture demand (Macmillan, 2012). This involves the planning of a compact calving season (Dillon et al., 1995; Verkerk, 2003) to coincide with the onset of the grass growing season (Washburn and Mullen, 2014; Horan and Roche, 2020). Existing research indicates that there are challenges associated with the technical aspects of achieving and maintaining a compact calving season (Macmillan, 2012). This is because it requires high levels of reproductive performance (McDougall, 2006; Butler et al., 2010; Berry, 2015) and management (Macmillan, 2012; McDougall et al., 2012) to get cows back in calf within ~80 d postcalving (Roche et al., 2018) over a short, 10- to 13-wk, seasonal breeding period (Hennessy et al., 2020).

In pasture-based systems, the proportion of cows calved in the first 6 wk of the calving season (**6-wk CR**) is used as a key metric of the degree of compactness of the herd calving pattern (Shalloo et al., 2014).

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The 6-wk CR is affected by the rate at which cows became pregnant in the previous breeding season (i.e., the 6-wk in-calf rate), as well as the number and timing of calving's from replacement animals calving into the main herd. In Ireland and the United Kingdom the industry target for 6-wk calving rate is 90% (AHDB, 2019; Shalloo and Hanrahan, 2020). Similarly, New Zealand and Australian dairy farmers set a target of 88% and 94%, respectively, for the number of cows in the herd calved in the first 6 wk of the calving season (Dairy Australia, 2017; DairyNZ, 2020).

At farm level there is a statistically significant association between the 6-wk CR and cow survivability, calving interval, and AI usage (Shalloo et al., 2014). It has been shown that there are financial benefits for farmers who improve their 6-wk CR; every 1% increase in 6-wk CR has been valued at €8.22 per cow/yr (Shalloo et al., 2014). However, there is evidence that the advantages of increasing a herd's 6-wk CR extends beyond improving profitability. Insights from New Zealand and Australia suggest there are benefits where labor and time efficiency is concerned, because of less time spent feeding dry cows, observing cows for calving problems, as well as time saved from streamlining calf rearing and heifer management (DairyNZ, 2017).

Research on farmers' uptake of technology is prominent internationally, where quantitative and qualitative approaches are employed to understand a range of behavioral and attitudinal determinants where farmer decision-making is concerned. In Ireland, recent studies have focused on farmers' adoption of, or engagement with, grassland management technologies (Hyland et al., 2018; Regan et al., 2021). Similar studies, focusing on technology adoption and farmer engagement, have been published regarding animal health on dairy farms (McAloon et al., 2017; Fischer et al., 2019; McFarland et al., 2020). Despite the importance of 6-wk CR to seasonal calving pasture-based systems, to the authors' knowledge no existing research has examined the factors influencing the implementation of 6-wk CR from farmers' perspectives.

In a context where it is argued that the 6-wk CR (Shalloo and Hanrahan, 2020) can have financial (Shalloo et al., 2014) and labor-saving benefits (DairyNZ, 2017), the aim of this study was to explore the factors influencing farmers' implementation of 6-wk CR, as a key performance indicator (**KPI**) for pasture-based dairy systems. Considering that many of the countries synonymous with pasture-based dairy production (Roche et al., 2017) have the same target for this KPI (AHDB, 2019), or very similar (Dairy Australia, 2017; DairyNZ, 2020), this study aims to also provide useful insights to international audiences.

METHODOLOGY

Background

The empirical research undertaken for this study was focused on farmers participating in an extension program, which spans 3 Irish regions and a diversity of dairy farm systems. The Teagasc/Aurivo Joint Industry Programme operates in the Midlands, West, and North West of Ireland. Teagasc is the Agriculture and Food Development Authority in the Republic of Ireland; Aurivo is a multipurpose cooperative that includes more than 1,000 dairy suppliers. Average farm size, herd size and farm profitability (€/hectare) of farms in the West and North West are the lowest in Ireland (Dillon et al., 2021). However, on average farms in the Midlands and East are the largest in the country in terms of both area farmed and herd size (Dillon et al., 2021). Previous studies by Läßle et al. (2012) have taken a regional approach to understanding agricultural conditions. The region under research in this study, the border, midlands, and western (**BMW**) region, has lower stocking density (livestock units per hectare) than all but one of the other 3 regions of Ireland. Much of the BMW region is in the western half of Ireland, which has higher rainfall (1,000–1,400 mm) than the eastern half of the country (750–1,000 mm; Met Éireann, 2022). The wet, poorly draining mineral soils are attributed to the region having the lowest mean grazing season length of 205 d (Läßle et al., 2012). Despite being considered a “less advantaged” area (Läßle et al., 2012), a research station in the BMW region has demonstrated that grazing seasons averaging 270 d from February to mid-November are achievable (Patton et al., 2012).

The Teagasc/Aurivo Joint Industry Programme has particular attributes, in terms of its breadth of focus, its public-private partnership, and its approach to agricultural extension, that are comparable to other programs internationally. The purpose of the program is to improve on-farm efficiencies and in turn farm profitability of participating milk suppliers. The Teagasc/Aurivo Joint Programme has multiple objectives including but not limited to the improvement of grazing management and grass production skills, improving milk quality, reducing antibiotic usage, and improving herd fertility management practices. Improving herd fertility management practices includes specific reference to improving calving intervals and 6-wk CR (see Teagasc, 2021). The Teagasc/Aurivo Joint Programme has similarities to programs such as the InCalf Programme in Australia and New Zealand, which focus on measured improvements in herd reproductive performance (McDougall et al., 2014), but it is different

in the sense that it has multiple objectives other than reproductive performance.

There are several extension approaches through which the Teagasc/Aurivo Joint program pursues its objectives, including discussion groups, focus farms (similar to monitor farm programs), farm walks, demonstrations, and specific events for the general public or farmers that may not be participating in discussion groups, and publications or media (see Teagasc, 2021). Approximately 300 Aurivo milk suppliers participate in the farmer discussion group component of the Teagasc/Aurivo Joint Programme. Discussion groups are a popular extension tool in Ireland (Prager and Creaney, 2017) because they encourage peer-to-peer learning (Morgans et al., 2021). In addition to providing a forum for farmers to discuss current farming topics, gain skills, and share experiences, participation in a discussion group is associated with increased farm profitability (Hennessy and Heanue, 2012). Extension agents act as facilitators during these meetings (Morgans et al., 2021) and prepare topics for discussion. In the Teagasc/Aurivo Joint Programme, the topics for discussion vary between each group, and in the majority of cases, the topics are determined by the group members at their annual general meeting, are based on the topic(s) preferred by farmers hosting the group meeting, or both. Nonetheless, the topic of 6-wk CR specifically arises regularly and practices associated with achieving or managing a high 6-wk CR are commonly discussed.

At the time of data collection, the first author on this paper was a co-facilitator of these discussion groups. The opportunity to undertake research to understand farmers' experiences of implementing a 6-wk CR was identified, particularly in the context of relatively low levels of improvement for this KPI at a national level (i.e., increased from 53% in 2012 to 67% in 2021; ICBF, 2021). As farmers in the BMW region have to contend with challenging climatic conditions and typically poorer soil quality we hypothesize that any advantages for them, through improving 6-wk CR, are also likely to be relevant to farmers in other regions of Ireland or internationally with similar or more favorable grazing conditions.

Research Approach

Similar to several recent studies (McDonald et al., 2014; McAloon et al., 2017; McFarland et al., 2020), we employed a qualitative, narrative research approach using farmer case studies. Qualitative research supports analytical depth rather than breadth, which is typically pursued by quantitative, statistically representative studies. However, it is also the case that qualitative case studies, although not statistically representative,

can generate theoretically generalizable findings (Todes and Galvin, 2005; Flyvbjerg, 2006). For instance, where the research presented in this paper is concerned, insights from the case studies provide an evidence base for comparisons and contrasts with qualitative case studies of farmers elsewhere, contributing to the body of knowledge (Flyvbjerg, 2006). Qualitative research is particularly useful for understanding human behavior, as it allows the researcher to explore and understand the whole variety of often interdependent factors which, combined, lead to behavioral outcomes. Narrative research, a mode of qualitative research, is distinctive because of its open-ended, unstructured approach to data collection, which avoids researcher bias in the data collection process. Furthermore, in the absence of structured questions designed by the researcher, which inevitably frame the focus of interviewees' responses to the questions, obsequiousness on the part of interviewees is reduced by employing a narrative, participant-centered data collection approach. The interviewee is encouraged to tell their story, eliciting a narrative that represents what is important to them in relation to a particular topic, rather than focusing only on aspects that are of particular interest to the researcher. In this respect, because the research aim of this study is to understand in depth the factors influencing farmers' experiences and decision-making in relation to implementing 6-wk CR, it is important to note that the open-ended narrative approach to interviewing is accommodating of interviewees' potentially negative critique of the 6-wk CR. Similar to the approach taken by Brownlie (2012), we continued to use the term "6-wk calving rate" because it is the most commonly used and understood term in the industry. However, we recognize that this terminology is technically incorrect because it refers to the proportion of cows calved at a particular time point and would therefore be more accurately termed calving risk.

Data were collected using the biographical narrative interpretive method (**BNIM**) (Wengraf, 2011) because of its capability to investigate in depth interviewees' experiences of phenomena. Interviews were conducted by the first and second authors of this paper using a 2-phased process involving an initial single question to induce narrative (**SQUIN**) where the interviewee tells their story, uninterrupted by the interviewer, leading to a second session where the interviewer may ask, if needed, for more information on topics introduced by the interviewee in the first session. Interviews were audio recorded, transcribed, and anonymized for analysis. The SQUIN used for the interviewees was, "As you know, I am researching the 6-week calving rate, so can you please tell me the story of your experience with it?" Using the BNIM, the SQUIN is always followed by

the following statement: “All the experiences and the events which were important for you, personally, start wherever you like. I’ll listen first, I won’t interrupt. I’ll just take some notes in case I have any further questions for after you’ve finished telling me about it all” (Wengraf, 2011).

In advance of the interviews, interviewees were issued with a participant information sheet that explained the 6-wk CR and with a consent form for research ethics purposes. Teagasc’s Social Science Research Ethics Group protocols were followed. As the interviewees were members of discussion groups that had discussed and focused on 6-wk CR to varying degrees, they were all already familiar with the term. The average duration of the interviews was 90 min, ranging from 45 to 176 min.

Some researcher bias in favor of the 6-wk CR may have been present, owing to 6-wk CR being one of multiple KPI focused on by the extension program. However, due to the unstructured nature of the interviewing process, bias resulting from the formulation of particular interview questions was avoided. A core aim of the research was to understand 6-wk CR from farmers’ own perspectives and experiences at the farm level.

Sampling

Purposive (nonrandom) sampling was employed to strategically select case-study farmers based on their relevance to the research question and to include diverse farmers (Bryman, 2008, p. 415). Interviewees were chosen based on the following criteria: farm size, age of farmer, farm system, cow breed, and rate of implementation of the 6-wk CR for 2018 (Table 1). For this study, 3 broad categories of farmers were selected: farmers with a high 6-wk CR (>80%; AHDB, 2019), farmers below the Irish national average 6-wk CR of 64% at the time of data collection (ICBF, 2021), and finally farmers achieving a 6-wk CR in between these 2 categories (65–79%). The purpose of interviewing farmers achieving differing 6-wk calving rates was to explore the different experiences of these farmers in implementing 6-wk calving rate on their farms.

Cases were selected in the geographical areas where the Teagasc/Aurivo Joint Programme is or was in operation: the Midlands, West, and North West region. Within the region, there are variations among farms with regard to grazing intensity (Green, 2019). In 2020, the average herd size in Mayo and Sligo (62 and 60 cows, respectively) was smaller than in Galway in (n = 78 cows), Westmeath (n = 99 cows), and Donegal (n = 98 cows) (CSO, 2021). Interviewees were selected from each of the counties in the regions: Galway (n = 2), Mayo (n = 3), Sligo (n = 1), Donegal (n = 1), Westmeath (n = 3; Figure 1), and one of the interviewees

had a second farm holding in Roscommon. The average age of dairy farmers in Ireland is 52 yr of age (CSO, 2021), the participants in this study had an average of 46 yr of age (range 28–60 yr).

Participants

Following Fischer et al. (2019), we used data saturation, the point at which no new insights were being generated, as a guide to stop interviewing more respondents. In the present study, we reached saturation after conducting 10 case studies.

Interviewees’ experience as the main decision-maker on the farm was on average 17 yr, ranging from 4 to 32 yr. The interviews were conducted in the home, or on the farm, of the interviewees. All interviewees were male and had an agricultural qualification. Two interviews were conducted with both the husband and wife present, both of whom are active farmers. No interview was conducted with a female farmer alone as it was challenging to find a female farmer in the region under study. This reflects national statistics where less than 14% of all farm holders are female and of all enterprises the lowest proportion of female farm holders (7.8%) is on specialist dairy farms (CSO, 2021).

The analysis draws on the theoretical framework of McAloon et al. (2017) which identified that farmers’ knowledge constructs and values contextualize and inform their experiences and influence their decision-making. Briefly, knowledge constructs are divided into

Table 1. Socio-demographic characteristics of the case-study farmers (n = 10)

Characteristic	Number of farmers
Age (yr)	
≤40	4
41–50	1
51–60	4
≥60	1
Educational level	
Level 6 or below (agricultural college courses)	8
Level 8 (university undergraduate degree)	2
Farm system	
Liquid milk production	3
Manufacturing milking production	7
Herd size	
≤100 cows	2
101–150	5
≥150	3
Cow breed	
Holstein Friesian	4
Holstein Friesian × Jersey (crossbred)	5
Montbeliarde	1
6-wk calving rate (2018)	
Low (≤65%)	2
Moderate (66–79%)	2
High (>80%)	6

knowledge claims, cultural scripts, and practical consciousness. Knowledge claims are statements of what actors know to be true or false, often with reference to a formal information source. Cultural scripts are beliefs, often communicated with reference to a story, saying, or parable. Practical consciousness is the knowledge that is played out in everyday routines, sometimes unconsciously. Values are what motivate farmers and are divided into cultural capital, social capital, and economic capital. Cultural capital refers to the pride and esteem farmers associate with particular objects and actions; social capital is the value that farmers associate with social relationships with others; and economic capital is the value associated with monetary or material wealth.

Using this framework of knowledge constructs and values as an analytical tool, the data were described qualitatively using a similar approach to McFarland et al. (2020). The analytical aim of qualitative description is to report “the facts, and the meanings participants give to those facts” (Sandelowski, 2000, p. 336). A multidisciplinary team consisting of 2 sociologists, an advisor/facilitator, a veterinary scientist, and an agricultural scientist initially read the transcripts to gain

familiarity. Then, transcripts were divided between members of the multidisciplinary team and examined to identify evidence of the knowledge and values (as described by McAloon et al., 2017) that influence farmers' decision-making regarding 6-wk CR. A cyclical process was used to discuss and integrate findings of the multidisciplinary team and plan further analytical steps. Each of the authors read the transcripts 2 to 3 times before highlighting and coding the relevant parts of the transcripts, which allowed us to identify and trace patterns. Excerpts from the data relevant to a pattern were given a code name (Tracy, 2013). No pre-set codes were applied in the analysis; rather, the codes were “data derived” (Sandelowski, 2000, p. 338), which means we interpreted the data to reach new, modified, and then final codes that described patterns in the data. Each of the authors presented their coded passages to co-authors. If necessary, certain passages were recoded until consensus was reached by all authors. The final major themes and, within these, coalesced subthemes were refined and agreed upon by the multidisciplinary team of co-authors.

In qualitative descriptive analysis, Sandelowski (2000, p. 339) recommends that re-presentation of data should be “organized in a way that best fits the data.” Employing this approach, we present the patterns under a selection of headings under which the data can be comprehensively and logically presented as well as illustrative quotations from the interview transcripts.

Limitations

The research presented in this paper is derived from a limited number of qualitative interviews, undertaken with case-study farmers that are not representative of Irish farmers at the national level. As a study of farmers' subjective experiences of implementing 6-wk CR, a qualitative methodology was employed to understand the case-study farmers in depth. Future research could involve a survey of a nationally representative cohort of farmers, to assess the applicability of the themes identified through the qualitative case-study research.

RESULTS

The “good farmer” is a concept, prominent in the sociological literature, used to draw attention to different notions of what is good. Here, we refer to the good farmer from the perspectives of the farmers interviewed (Burton et al., 2021). Using the framework of knowledge constructs and values as a lens to identify what influenced and motivated farmers where the 6-wk CR is concerned, 5 themes were identified, which are largely interrelated: the good farmer; farmers support

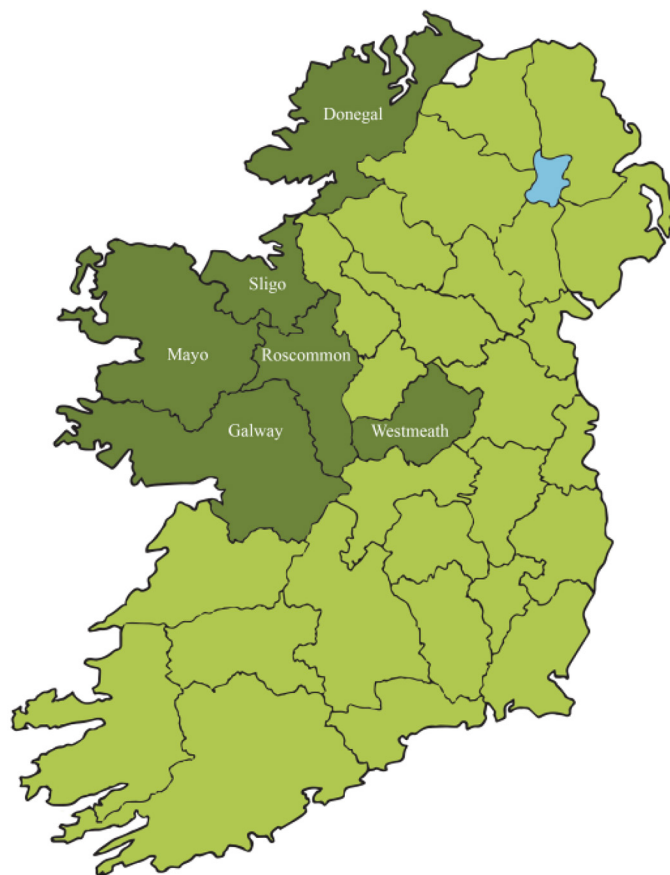


Figure 1. Geographical location of the study.

networks; free time and family time; simplicity of a structured system; profitability and monetary gain. Within one of these themes (simplicity of a structured system), 3 further subthemes were identified: ease of calf/heifer rearing, bull calves, and intense work, whereas an additional subtheme grass-based system was identified within profitability and monetary gain. Each of the themes is described below with illustrative quotations from the interview transcripts.

The “Good” Farmer

The findings of this study suggest that a high 6-wk CR reflects positively on both the farm and farmer. It is perceived as an important “measure” and “target” for farmers, in particular those with high levels of performance (Table 1). Interviewees spoke about “wanting a good figure” (a high 6-wk CR) and they described their pride when they improved on this:

For me, my 6-week calving rate was low when I started, [it was] down in the 25s–30s...we have to try and get it better and better...but I was proud when I saw the increase in my figures on the last walk where we hit 70%. We could see it, looking out on the farm.

Interviewees explained their sense of achievement when they improved their 6-wk CR. An interviewee who almost reached the industry target described his achievement as “pretty awesome.” Interviewees used terms such as PR (public relations) to emphasize the association between a high 6-wk CR figure and what is perceived by other farmers and the wider dairy industry as a “good farmer”:

One of the things that motivates us is a higher 6-week calving rate. So you know a bit of it is marketing, a bit of it is PR, all this sort of thing...the new targets I'd be setting for myself would be 90% in the 6 weeks...if we're already at 85%...I won't say it's unhappiness or otherwise, it's about raising the bar, setting better targets. So I don't want to be complacent in saying it and you know I don't want to attract some “feekin” bit of misfortune on top of myself but 80% for me now is not an acceptable target. In that I want more now.

Interviewees concurred that achieving and maintaining such high levels of performance is a challenge. Interviewees emphasized that maintenance of a “good figure” (rate) requires high levels of management and focus,

with no room for complacency. One farmer achieving high levels of performance described the industry target of calving 90% of the herd in 6 wk as a “savage target” (a difficult target). Although reaching the industry target may have been desirable for some of the interviewees, many were still satisfied as long as their 6-wk CR did not drop below 80%:

I heard recently 85% is still an A, like. So we are still in the top couple of percentage; I'm not going to cry over 5 or 10% at this stage. I'll get it through time...it's a target, it's something to go toward. Maybe, if I say I'm happy with 85% I could go back to 75%. So it's maybe just to keep myself focused on really trying to get that every last percent out of it...if you are happy where you are you'll go backward. I don't want to get complacent, so that's really why I'm trying to keep focused you know.

Evidently, for many interviewees 6-wk CR is “vital,” “a no-brainer,” and “these are the kind of measurements that help you to perform better.” Some of these interviewees also perceived that others were often “not tuned into the importance of it.” This “importance” led some of the interviewees to question the 6-wk CR “recipe.” In contrast to the interviewees who wanted to maintain a 6-wk CR of greater than 80%, others were satisfied if their cows calved within a particular time frame (e.g., 10–12 wk). They also questioned whether their performance as good farmers should be judged by advisors and peers (in a discussion group context) on the basis of one single KPI:

Some farmers would feel out of place or feel, a bit you know, it's a shite year now because I'm not fitting the profile... And a farmer shouldn't be feeling out of place because he's calving, his calving pattern is a month longer if that's all his system can cope with...90% calved in 6 weeks, you know that's not the be-all and end-all.

Farmers' Support Networks

Six-week CR data are often used for benchmarking during discussion group meetings, where farmers are facilitated by extension agents to discuss how they can improve. One interviewee commented that “sometimes you'll learn more from the lad who's not doing it right as the lad that is doing it right,” highlighting there is something to be learned from all group members. Although there can be “a multitude of reasons not to do something,” it was acknowledged that peer pres-

sure within the group can act as a catalyst for practice change. For complex KPI such as 6-wk CR, the group also provides support, which gives confidence to implement the necessary changes. One interviewee described the important role his local discussion group has played in terms of his education:

Well, I mean, I never got, I never went to university—I left school when I was 15 years of age and whatever I learnt I learnt myself. And the only education I got then was from the group.

The strong evidence of networking and knowledge exchange with peers among the interviewees was not surprising, considering the sampling strategy of our study, which focused exclusively on members of discussion groups. Seeing positive outcomes being achieved by peers, through improvements made to KPI such as 6-wk CR, can lead to some farmers questioning how they can improve on their performance:

I would be looking at farms I would share information with and maybe some of those farms would be farms that we bought heifer calves off and would have similar breeding to us, very similar land type...I suppose that is who I would be comparing against...anytime I see their figures and I see that they're doing something better than what we're doing here, you know you're kind of looking why...or what's stopping us [from] doing the same?

Interviewees were also influenced by the latest research findings and placed a high value and trust in the new scientific information from dairy research farms such as Teagasc, Ballyhaise and Teagasc, Moorepark. These institutions promote 6-wk CR and demonstrate the practices that can achieve high levels of performance in this regard. Some interviewees were willing to implement similar systems and practices despite potential social disapproval:

We put a huge amount of emphasis on everything we do and what's being done in research... And we didn't give a [expletive] what anyone else thought that was what we were doing, that was it, like. And the research was there in front of us, we just went with it.

Extension agents from Ireland, New Zealand, and Australia, as well extension programs such as the Teagasc/Aurivo Joint Programme, were also valued sources that present new research to interviewees:

You buy into the research that Teagasc are doing and Aurivo helped; they are the profitability programme... He [co-op advisor] gave me advice and strong advice, wasn't on the fence about it; if you want to improve, this is what you have to do, you know.

Other sources of information or inspiration in relation to 6-wk CR for the interviewees included overseas experiences in countries such as New Zealand, veterinarians, and podcasts.

Free Time and Family Time

The majority of interviewees concurred that by increasing their 6-wk CR they benefited from more free time or periods of reduced workload or, more importantly, time to spend with family. Interviewees with increasing or high 6-wk CR were more cognizant of this social value. However, the ability to go on holidays, have a reduced workload around key times of the year such as Christmas, or both, was alluded to by the majority of interviewees. Compact calving through improvements to the herd's 6-wk CR can make these aspirations a reality. That same benefit in terms of social capital, albeit to a lesser extent, can be extended to liquid or winter milk suppliers through managing their breeding season to avoid cows calving at that time. For one interviewee, the negative experience of a cow calving on Christmas day and missing a large portion of the day with his family provided an "initial catalyst" toward more compact calving:

I looked to compact the calving, in that one particularly frustrating experience for me, was that we had a family, a major family gathering Christmas day, a good number of years ago... Hannah and I were married, we were all heading back to my parents' house for the Christmas dinner. So it was everybody had put the effort in, it was organized, it was planned. And I was the weak link in the whole thing in that everybody else honored that invitation...I suppose from that moment on I felt the heat in that it wasn't the section that bothered me, it wasn't the vets call out, it wasn't the risk of losing the calf, it was the realization that a commitment I had made to my own mother, to my family, to my wife, that I couldn't honor it and I could have avoided all of that with a bit of planning.

For spring calving herds, a high 6-wk CR also provides the opportunity to dry-off the cows' pre-Christmas.

This 6- to 8-wk period of reduced workload can be used to get calving facilities ready but also allows for “some weeks to yourself” because “you need to be fresh” going into the calving season in early spring.

Regardless of system, having a compact calving season that allows some free time after calving and breeding was viewed as positive. Many interviewees used this free time or periods of reduced workload to prepare for the next busy period or to carry out some less important tasks on the farm, whereas others felt it was “invaluable” to be able to go on a family holiday:

When there are more cows calving in a short period of time, you're more intense on watching the cows and working with them. Then it leaves a lot of time free when the compact calving period is over.

Whereas interviewees positively identified that a high 6-wk CR allowed for more free time, the opposite was true with a spread-out calving pattern:

Instead of taking it easy you were ending up, you were working 14 hours plus in the day...and as a result then you were the worst in the world in your own house. Because you were never there; everyone else was at home.

Simplicity of the System (Structured)

Closely connected to the theme of having more time, having a high 6-wk CR was identified by interviewees as an advantage in providing “structure” to the farming year and simplifying the system. Later-calving cows were described as a “torture,” and a prolonged calving season was, in most cases, undesirable. Although the calving season is labor intensive, interviewees typically preferred to work hard because “it sets up the year.”

I think someone described it once as one big party everyone is together at it, just everything is together. And we are drying off big batches together because they are all calving in batches. It's just all together like.

Ease of calf and heifer rearing, bull calves, and intense work emerged as subthemes of simplicity of the system. Results from these subthemes will now be presented.

Ease of Calf and Heifer Rearing. A key benefit of having a high 6-wk calving rate is the structure it brings to calf and heifer rearing. Calves from farms with high 6-wk CR are of a similar age and weight and can be managed as one group, which reduces workload:

The biggest advantage is rearing groups of calves when they are in a more compact period... it leaves work very much reduced, compared to years ago. The calves are all around the one size when born at springtime. You're not letting out 2 or 3 groups of small calves; you're letting out one group of similar-aged calves and that's very handy... That is where we see a huge saving on work. Every one of them in the group went out. They all stayed together as a group, which was lovely. That's just one group, whereas years ago that could have been 4 groups. That is a huge labor saving.

The benefit of a uniform group of calves extends beyond the calf rearing stage. This is advantageous for farmers in a pasture-based system who aim to calve heifers at 24 mo of age. Achieving this involves heifers having to meet specific target weights during their development:

If your cows are calving early, your heifer calves are born early; they have a better chance of meeting all their targets all the way through.

Bull Calves. The challenge of managing bull calves was a concern for all farmers interviewed. Interviewees questioned the sustainability as well as consumer and societal perceptions of having a large number of bull calves. There was particular reference to the “crossbred bull calf,” which in Ireland typically refers to calves with some Jersey genetics. This poorer quality calf for beef farmers, in combination with the large supply of calves, means “you're not going to get a (good) price for a calf.” This was perceived as a “major issue to be addressed now going forward” for the dairy industry, and the apparent need for change and improvements in this regard were discussed:

The bull calf, I suppose that's another problem that the whole season will become so compacted now... somebody has to start thinking outside the box, I don't know, it's going to be the biggest drawback on the dairy industry going forward now. I know people say its only 6 weeks and sure now we don't worry about the bull calves and it's all over till next spring. But no use in burying our heads in the sand either. It won't be long coming around again.

One interviewee questioned whether a reduced 6-wk CR would help alleviate the problem of having a large surge of bull calves born at the same time:

It's again you might be better off in the long term just not being so compact for calving. If I had calved 10 or 15 cows earlier or another 5 or 10 cows later there wouldn't have been a glut. There wouldn't be so many gluts in the system. If that was happening nationally there would be less gluts as well.

Intense Work. The workload associated with a high 6-wk CR can be “daunting.” The majority of interviewees acknowledged that 6-wk CR brings challenges, and comments such as “it’s a double-edged sword,” “I’m conscious of burnout,” “it’s a matter of getting through this period,” and “I couldn’t cope with it” all suggest that adequate labor and facilities are essential to manage the “pressure.” Without having the people or facilities in place, adverse weather events can further intensify the workload at calving time. A negative experience for one farmer with a high 6-wk CR caused him to question the benefits of achieving a 90% 6-wk CR:

Now I know it was a tough year because the snow came in March and that. But we just found even that aside just the workload, the relentlessness of cow calving after cow after cow... And I would've lost a couple of cows that maybe or maybe not, might have been avoided if we weren't under so much pressure... I just felt there was never a minute...this year it wasn't as compact...I just felt it was easier going...the way I'm thinking now; I wouldn't be in as big a hurry to push the 90% 6-week rate. I feel by just pushing it out that bit, I think would take a lot of pressure out of the system. And if it saved some losses of both calves, or maybe cows, that it could offset any losses in terms of milk and that.

Despite the intense workload, for most interviewees the benefits of increasing 6-wk CR in terms of social, cultural, and economic capital outweighed the negatives:

Couldn't anybody sit down here at the table with me and put an argument forward on any grounds, we are under as much [expletive] pressure as anybody when that period hits. But still you couldn't see any merit to doing it any other way.

Profitability and Monetary Gain

Economic capital featured prominently in all of the interviews. Interviewees alluded to several financial benefits associated with having a high 6-wk CR (e.g.,

improved cash flow and increased profitability). For spring-calving herds, the key factors required to realize these financial gains were calving compactly at the onset of the grazing season to achieve a long lactation on a predominantly pasture-based diet:

But the 6-week calving rate starting in early February, setting your herd up for spring grass and a long lactation. The 6-week calving rate is paramount to profitable milk production.

Interviewees considered a high 6-wk CR to be “a no-brainer in terms of money,” could “see financially how it makes sense,” and were typically willing to put the “effort in for the financial rewards that are there.” One of the most commonly cited economic benefits of a high 6-wk CR was cash flow. Cows calving compactly means there will be more milk sold “which translates into more money, and [when] you see the benefit obviously of that you're not going to go back to the old way.” This “cash” can be used for personal drawings or “to pay for things.” Several interviewees discussed their experiences of a low and high 6-wk CR in terms of cash flow. The effect of earlier and compact calving was positive on cash flow and overall financial performance, whereas a low 6-wk CR and late calving cows had a negative effect:

We've seen the difference in cash flow from a good 6-week calving and a bad 6-week calving [rate]... We had a hit on cash flow for a few years...late calvers weren't paying the bills in a spring calving system... And the first year we really started getting the cash flow was the February check, it was the big one for me...I love the cash flow. I love the money in my bank account. It makes life easier; you are not worrying about overdrafts.

However, one interviewee producing liquid milk had an alternative view, that 6-wk CR was of little relevance because the volume of milk produced per cow was the driver of profitability:

The liquid milk you're paid on volume full stop, OK... And if you can have cow numbers and produce milk, it's just as easy [to] keep them milking all year round, on big volumes of milk, volume pays... And the second thing is here our milk fats and proteins are a steady average. We don't have strong solids, but [they are] there or thereabouts sometimes better than a co-op average. So when you put that co-op average on a big volume of milk, you're getting a good milk check.

Grass-Based System. Having a high 6-wk CR means that cows could, if weather conditions allowed, get “to grass every day from once they calved.” The benefit of this is the ability to “harvest grass, and turn it into milk solids.” Based on the interviews, it was possible to draw clear parallels between an interviewee’s perceptions of maximizing grazed grass in the diet and increasing farm profitability. Although all interviewees acknowledged the economic importance of grass to their farming systems, those with high 6-wk CR were often more focused on maximizing grazed grass in the diet:

You want them calved as early as possible to make the most of the grass. . . So my whole system falls down if I don’t get them to grass. . . That’s the way I work, and now I push that a bit more in calving earlier, but that’s to get the longer lactation. . . that will make you more money. . . you are going to get more solids. To me it’s not a complicated thing.

DISCUSSION

The aim of this study was to conduct qualitative research to understand in depth the factors influencing farmers’ experiences and decision-making in relation to implementing varying levels of 6-wk CR. To our knowledge this is the first study of its kind (i.e., a qualitative narrative approach) and the first study that explores farmers’ experiences and decision-making in relation to 6-wk CR. In agreement with McAloon et al. (2017), this methodology was successful in generating a rich data set for analysis.

The interviewees in the present study highlighted that monetary gain is important to farmers (consistent with McDonald et al., 2014) and that the occupational identities of farmers is becoming increasingly business-like (Deming et al., 2018). The majority of interviewees were in agreement with Shalloo et al. (2014) that having a high 6-wk CR had economic benefits such as improved cash flow and more DIM (increased productivity). To capitalize on these potential benefits, interviewees identified having a calving date in early spring that coincided with the grass growing season as well as having a high 6-wk CR (Dillon et al., 1995) as being requirements “to make the most of the grass.” This highlights that the case-study farmers are keenly aware that grazed grass is the cheapest feed available to them (Finneran et al., 2010) and they indicated that the most profitable pasture-based dairy systems are those with higher levels of pasture utilization with limited use of supplementary feed (Ramsbottom et al., 2015). However, although important, it is evident from this study that profit maximization is often not

the main driving force for farmers (following Vanclay, 2004). This study highlighted the importance of other, noneconomic factors that should be considered when promoting 6-wk CR.

The majority of interviewees felt that an increasing, or high, 6-wk CR “figure,” reflected positively on both themselves and their farms. For this reason, many of the farmers interviewed wanted to improve on their current 6-wk CR figure. The findings point toward established KPI being used as an indicator of a “good farmer.” What constitutes a “good farmer” is a hard-earned title among farmers that acknowledges peer appreciation and status of a farmer within the community (Burton et al., 2021).

Several the case-study farmers were achieving high 6-wk CR (>80%) and in one case reaching the industry target of 90% calved in 6 wk. Although this was perceived by the farmers as desirable, they also suggested that as long as the 6-wk CR did not drop below 80% they were satisfied. Therefore, this study concurs with Macmillan (2012) in highlighting the fickle nature of 6-wk CR rate due to the challenges in maintaining such high levels of performance. Striving to maintain or to achieve a high 6-wk CR was described by a farmer as entailing “a lot of actions.” It may be useful for future research to focus in greater detail on these actions from a farmer’s perspective to better understand how to support farmers to improve on or to maintain a high 6-wk CR.

In addition to monetary gain and being a “good farmer,” the structure and simplicity that a high 6-wk CR can bring to other parts of the farming system were alluded to by interviewees. Similar to comments made by Australian and New Zealand dairy farmers (DairyNZ, 2017), ease of calf and heifer rearing were commonly cited as advantages of a high 6-wk CR. The potential to have more free time for farmers to spend as they please, in particular with family, was also a key motivating factor for interviewees to improve their 6-wk CR. Further highlighting the importance of social capital were numerous references to holidays and Christmas as important periods to have a break from farming and to have a reduced workload. Having a high 6-wk CR in spring-calving herds provides these opportunities (e.g., between calving and breeding and at Christmas). To encourage farmers to improve their 6-wk CR, such benefits could be outlined in addition to the potential for increased cash flow and profitability.

It is important to note that the use of 6-wk CR as an industry KPI suggests that maximizing this metric is optimal for all farm systems and farmers in the country. However, a high 6-wk CR is not without its disadvantages. In many cases interviewees described the intense workload associated with a high 6-wk CR especially

at calving time itself. It was beyond the scope of this paper to document how farmers were managing this workload. However, hired or improved labor efficiency, which is largely underpinned by the management practices and facilities available on the farm, is likely to play a significant role (Deming et al., 2019). Nonetheless, most interviewees were willing to embrace this workload to reap the aforementioned benefits.

In addition, in line with international perspectives, interviewees in the present study aired concerns in relation to the management of bull calves (Renaud et al., 2017; Shivley et al., 2019). This was viewed as a major drawback associated with a high 6-wk CR. Solutions such as the use of X-chromosome carrying sexed semen, as well as other strategies, have been identified to reduce the effect of Jersey genetics on the beef merit of dairy calves (Berry et al., 2018; Berry and Ring, 2020). The farmers interviewed were aware of and in many cases implementing such strategies; however, the need for additional solutions was apparent. With the calving season becoming increasingly compact a large surge of calves are being born at the same time, predominantly in February and March (Fenlon et al., 2017). This has negative repercussions for the demand and therefore the price received for dairy-beef calves. In recognition of this, in Ireland, for example, schemes such as the "Dairy Beef Calf Programme" have been established to help address these challenges (DAFM, 2021). The program provides a financial incentive for farmers to weigh dairy-beef calves they have purchased. It is unlikely such schemes will be sufficient to fully address the concerns raised and we suggest that further research on the topic of bull calves and dairy-beef calves is needed.

It is also important to note that not all interviewees perceived 6-wk CR to be of utmost importance. In line with previous research there is considerable heterogeneity among farmers (McKillop et al., 2018) and there are contrasting views on what the "right thing" and "good farm management" entail (Vanclay, 2004). Furthermore, farmers can have legitimate reasons for the non-adoption of practices, including those associated with improving their 6-wk CR (Vanclay, 2004). Considering the popularity of discussion groups among agricultural extension providers in Ireland (Hennessy and Heanue, 2012) and that farmers have different goals and are more likely to adopt practices that help them achieve these goals (Pannell et al., 2006), it may be beneficial to group farmers in discussion groups accordingly. Although this is commonly practiced in Ireland, it is still not uncommon to have discussion groups largely based on the proximity of group members to one another, based on their farming system (e.g., manufacturing or liquid milk), and so on.

A potential bias of the present study is that all farmers interviewed were regularly in contact with advisory services through discussion group membership. Due to this sampling strategy it was, therefore, unsurprising to find that most interviewees placed a high value on discussion groups. Bradfield et al. (2020) consider discussion groups to be a form of continued education for farmers and a forum in which they can discuss current farming topics, gain skills, and share their experiences. One interviewee emphasized this by saying that since he left school the only education he has received is through his local discussion group. Bradfield et al. (2020) also concluded that policies should be in place to achieve more widespread participation in discussion group. In agreement with this, the present study would suggest that encouraging increased participation in discussion group may be advantageous in terms of providing a forum for farmers to discuss topics associated with 6-wk CR (Ritter et al., 2016). Such policies may also help support the adoption of practices and technologies that lead to improvements in 6-wk CR (Ritter et al., 2016; Bradfield et al., 2020).

The principle of homophily, which maintains that contact occurs at a higher rate among similar people than dissimilar (McPherson et al., 2001), has been shown among farmers (Wood et al., 2014). In line with this, peers and discussion groups were most commonly cited as the key sources of information and support in relation to 6-wk CR. However, similar to Ritter et al. (2020), interviewees placed a high value and trust in science and new information from dairy research farms. Intensive one-to-one advisory support from Teagasc and Aurrivo co-operative representatives as well as veterinarians were among other sources of support in improving 6-wk CR. This drawing upon expertise from external sources is not surprising (McAloon et al., 2017) and points toward the important role of other actors in the Irish dairy innovation system in promoting 6-wk CR.

Farmers play a key role in dairy value chains (Heery, 2015); however, other actors and stakeholders, including those previously mentioned (e.g., veterinarians, agricultural advisors or consultants, co-operative representatives), also play a key role in the value chain and supporting innovation (Devitt et al., 2013). This study focused exclusively on farmers' experiences of 6-wk CR; however, future research on this topic or other complex KPI and technologies may benefit from taking an innovation systems perspective (Hall et al., 2006; Klerkx et al., 2012). Innovation systems perspectives can be employed to diagnose the performance of different sectors (e.g., the dairy sector) through the analysis of data collected from key sectoral stakeholders across

the value chain (Kilcline et al., 2021). The fact that agricultural innovation is suggested to be the outcome of agricultural innovation systems (Klerkx et al., 2012) further emphasizes the merit in such perspectives.

CONCLUSIONS

Pasture-based production offers the opportunity to provide a dual purpose of meeting the growing demand to feed a growing world population while doing so in an environmentally sustainable manner. A key to achieving this is the optimal use of natural resources by farmers, such as the adoption of compact calving to maximize pasture use. This study provided insights into 6-wk CR, an industry KPI for Irish dairy farmers, which is also highly relevant to seasonal calving pasture-based dairy systems worldwide. All but one of the case-study farmers considered a high 6-wk calving rate to be economically advantageous because of resultant improved cash flow, grass utilization, and DIM. However, other, noneconomic benefits, associated with a high 6-wk CR were also highlighted (i.e., the esteem of being a “good” farmer, the simplicity of a structured system, and more free time and family time). The farmers in this study placed a high value on their peers, in particular those in their discussion group, as a source of information in relation to 6-wk CR. Additionally, the role of other actors and stakeholders, such as veterinarians, agricultural advisors or consultants, and co-operative representatives, within the dairy innovation system in promoting 6-wk CR was emphasized. Disadvantages associated with 6-wk CR were also reported with the bull calf being considered one of the major drawbacks for dairy farmers and the dairy industry to address. These results are useful for extension agencies and agents who aim to support farmers to improve their 6-wk CR. Furthermore, these results further highlight that farmers can have multiple motivations to adopt or not adopt new practices, which must be taken into account not only in the design of extension but also in the design of technologies themselves.

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