



In Search of Invisible Cows **Collaboration, Resistance and Affection in** **Human-Animal Relationships on Contemporary Dairy Farms**

Abstract

The notion of “invisible cows” has become popular in Finnish dairy production. This concept emerges in a very specific historical context: Increasing herd size, changing technological infrastructure in cowsheds, and the transformation of farmer identities all contribute to a need for more intensified forms of collaborative practices between humans and animals. An invisible cow is healthy, corporally compliant, obedient, easy and collaborative both in its body and behaviour. Invisible cows form a uniform herd in which individual animals require minimal care from farmers. In this paper, we explore how this new ideal is manifested on dairy farms, and how it changes the agencies of both farmers and animals and affects human-animal relationships. We examine the notions of collaboration, resistance and human-animal affection and aim to build links between these concepts. Our discussion of everyday work on dairy farms reveals the unattainability of invisibility. In various ways cattle resist their enactment as see-through members of the herd. Furthermore, invisibility can also be resisted by farmers who embrace their relations with specific animals who fail to stay invisible. Our paper contributes to a more complex understanding of the intertwinement of human and animal agency within dairy husbandry and argues that collaborative and resistant practices are always entangled.

Keywords: Dairy farming, agency, human-animal relationships, collaboration, resistance, affection, technology

1 This paper is a collaborative effort and the authors are listed alphabetically.

Introduction

During the past fifty years, animal production, along with other branches of agriculture, has intensified and industrialised rapidly, resulting in fewer and larger farms and increased use of technology. For example, the number of dairy farms has decreased rapidly in Finland: between 2013 and 2018 there was a decrease of 29 percent, with 6250 farms practicing dairy husbandry by the end of 2018 (Niemi 2019, 36). Although dairy farms are still relatively small in Finland,¹ they are rapidly growing in size. Furthermore, almost all Finnish farms are family farms that are comprised of a farming couple or a single farmer, who live on and make decisions about the land that they work on. Larger consortium farms are still rare in Finland (9 percent in 2018) (Luke 2019a).

At the same time, the use of technology in cowsheds has increased. For example, automated milking systems (AMS) have been in commercial use since the early 1990s. They were first used in The Netherlands and subsequently in other Western European countries and North America (Holloway 2007, 1048). In Finland the first AMS were installed at the beginning of the twenty-first century. By the end of 2019, the number of farms with AMS was 1201, which amounts to 20.8 percent of all dairy farms in the country. It has been estimated that 42 percent of the milk produced in Finland is produced on AMS farms (Manninen 2020). Cows can move freely in free-stall barns on AMS farms and can initiate being milked by the milking robot. Moreover, other technologies, such as automated feeding systems and manure removal, are common in contemporary free-stall barns. In fact, the automated milking and feeding systems form a technological whole. The milking robot not only constantly generates information on the quality and amount of milk, but also gathers data regarding how much the cows eat, as well as their weight and how often they visit the milking stall. As Scout Calvert (2018, 74) has suggested, contemporary cows may be termed “information-generating machines”. Along with other technologisation, the practices of breeding have also changed. Molecular genomics are increasingly utilised in breeding, with the aim of creating animals that better adapt to the demands of contemporary dairy production (Lonkila 2017, 29).

During the last decade, the notion of “invisible cows” has become popular among industry actors and farmers in the Finnish dairy sector (Lonkila 2017). Invisibility signifies a new breeding goal that redefines both farmers and cows as better suited to the modern era of dairy breeding. An invisible cow is healthy, corporally compliant, obedient, easy and collaborative both in its body and behaviour. Hence, it is especially suited to larger herds and au-

¹ Over half of the dairy farms in Finland in 2018 comprised less than thirty cows (Luke 2019b).

tomated milking parlours. Invisible cows form a uniform herd in which individual animals require minimal care from the farmers. Invisible cows are aimed to make farmers' work easier by allowing them to focus on herd management rather than individual animals. The notion of invisible cows emerges in a very specific historical context, attached to various changing practices in farming that bring about the new enactment of a dairy cow. Increasing herd size, changing technological infrastructure in the cowshed, and transforming farmer identities all contribute to a need for invisibility and more intensified forms of collaborative practices. Genomic breeding practices, allowing for evaluation also for complex traits such as health and fertility, further contribute towards achieving the goal of invisibility.

This paper links together two sets of rich empirical data collected on Finnish dairy farms to explore invisibility and more-than-human agency within dairy production. It specifically examines the notions of collaboration and resistance and aims to build links between these two often-used concepts that help us to make sense of the agency of livestock animals. Our purpose is to contextualise the collaborative and resistant practices of dairy cows by analysing the conditions of modern livestock production in Finland. The concept of "invisible cows" helps us to perceive how the practices of more-than-human collaboration on modern farms are inseparable from economic, technological, and political developments in farming. We address the following questions: Why are new forms of collaborative agency needed? If collaboration takes place, at what cost? We are especially interested in finding out how the ideal of invisibility manifests itself on dairy farms, and how it changes the work of the farmer and affects human-animal relationships. We will concentrate on descriptions and observations of more-than-human everyday life and work, which Jussi Lehtonen (2019, 131–132) has advocated should be the focus of ethnological research on animals.

In the next section, we will present the theoretical framework of the study, followed by a more detailed description of our research materials and methodologies. The empirical analysis will focus on three themes that are discussed in relation to the ideal of invisible cows: collaboration, resistance and affection. The concluding section will summarise the most significant theoretical and empirical findings of the study.

Theoretical Approach

The theoretical framework of the study draws from posthumanist thought and new materialism. These approaches share many premises, such as an emphasis on relationality and the aim of questioning anthropocentrism. As Ferrando puts it: "Posthumanism is a philosophy which provides a suitable way of de-

parture to think in relational and multi-layered ways, expanding the focus to the non-human realm in post-dualistic, post-hierarchical modes” (Ferrando 2013, 30). Questions of agency have also been discussed in posthumanist and new materialist enquiries. Many researchers have proposed a relational understanding of agency, meaning that it is always constructed in relationships that may also include more-than-human actors (see, e.g., Barad 2007, 33, 178; Coole & Frost 2010, 8–10, 20–21; Despret 2013; Haraway 2008, 21–27, 32, 71; Nimmo 2015, 179). Following this line of thought, we understand agency not as an intrinsic and intentional feature of some individuals, but as “shaped by the co-presence of multiple intra-acting material-discursive and biosocial networks”, as Richie Nimmo (2015, 180) has asserted. As he further points out, human intentions are only one component in these networks, and they are significantly affected by more-than-human beings and objects, often resulting in contingencies and inadvertent corollaries (*ibid.*). According to Vinciane Despret (2013, 38–41, 44), interagencies are formed when interlinked parties enable each other to become agents in their reciprocal relationships.

In this article, we are especially interested in animal agency and its different manifestations in the context of dairy farming. Some researchers (e.g., Philo & Wilbert 2000; Hribal 2007) have argued that animal agency becomes visible primarily when animals resist what humans want them to do or what is done to them. Others have emphasised that the active agency of animals should also be taken into account in situations in which animals do what is expected of them, that is, when they collaborate with human beings (e.g., Pearson 2016, 14; Despret 2013, 42–44). The discussion on animal resistance has often focused on whether animal actions are intentional and if certain actions can be called resistance, or whether the concept is too anthropomorphic (e.g., Wilbert 2000; Pearson 2016, 12–13). However, as Kathryn Gillespie (2015, 127–128) has argued, there is a need for more thorough studies on the subject, particularly in terms of how resistance should be understood and responded to.

Christopher Bear and Lewis Holloway (2019) provide an in-depth analysis of the previous discussions about animal resistance and propose three different ways of understanding the phenomenon: spatial transgression, violent animal behaviour and relational resistance. Bear and Holloway criticise the conceptualisation of spatial transgression, or unwanted animal movement, as being too limited in its focus on human reactions rather than those of animals. Furthermore, they point out that this approach does not take into account that human-animal relations are often organised in negotiation with animals, and that they are not totally ruled by humans. As regards animal violence, Bear and Holloway suggest that violence is in fact not an indispensable trait of animal resistance. However, they do point out that animals resist in many other ways. They argue that animal resistance is relational, which is

consistent with our posthumanist premises in this article. According to Bear and Holloway (2019, 216):

[This interpretation] encourages exploration of resistance as distributed rather than directed by one actor against other, or against an amorphous “system”. Further, it allows for resistance to emerge not only between individuals (though does not preclude this) but also between different groups, which may themselves be emergent and heterogeneous, and as a co-production with attempts to control or to direct conduct.

In this article, we will apply the concept of relational resistance to our fieldwork material and to the ideal of invisible cows. Furthermore, we will critically discuss the concept of animal collaboration promoted by Vinciane Despret. She has argued for a conceptualisation of animal work in the context of production animals. Despret has suggested that in many cases this work is collaborative and that animals actively invest in it (Despret 2016, 177–183).² We will look at the manifestations of collaboration in detail in our fieldwork material and will discuss the limits and possible fractures in it. Finally, we will view the ideal of invisibility in the context of affective human-animal relationships, which are also formed in contemporary industrialised cattle husbandry (see, e.g., Wilkie 2010; Ellis 2014). As Jocelyne Porcher (2015, 11) states: “affects invested in working with animals are divided into the two big areas of friendship and power, and these are not mutually exclusive”.

Multispecies Fieldwork Practices

One way to put a posthuman framework into practice is to utilise multispecies or more-than-human research methods. This cluster of methodologies highlights the inseparability of human and other forms of life and strives to extend research beyond mere human experience (Hamilton & Taylor 2017, 6, 11; Bastian, Jones, Moore & Roe 2017). But what is the best way of including animals in data production in practice? Hamilton and Taylor (2017, 5, 57, 82) have proposed that researchers should attempt to challenge the unequal relationship between human researchers and animal subjects and acknowledge their agency. In practice, researchers working in multispecies environments usually ask people working or living with other animals to share their thoughts and presumptions about them in interviews or informal discussions. This approach is probably the most “direct route to be able to listen for and to the voices of animals” (ibid. 5). It has been suggested that a crucial premise

² The arguments espoused by Despret on animal work are based on the research of Jocelyne Porcher, which has been published in French for the most part. For an English discussion, see Porcher 2014; 2015; Porcher & Schmitt 2012.

of this approach should be to seek to understand other species “as significant social actors rather than as objects or materials” (ibid. 69).

In our fieldwork, we applied this framework when undertaking visits to Finnish dairy farms and conducting interviews with farmers and carrying out observations in the cowsheds. Although our fieldwork did not include long-term participatory observation, our visits to cowsheds and our encounters with both cows and farmers in their working environments had a profound impact on our understanding of the issues being studied. It must also be remembered that our presence in the cowsheds affected the demeanour of both the farmers and cattle. Although it can be argued that human voices dominated our empirical material, cattle also contributed in a significant way through their behaviour and actions, which affected both the interpretations of the farmers and our own (also see Lehtonen 2019, 131). Thus, it can be claimed that cows have participated in the co-production of knowledge in our research (see Bastian et al. 2017, 5-6) although we did not work in the cowsheds extensively. Seeing and recognising other animals as “embodied individual[s], rather than as an abstract faceless population” (Gillespie 2016, 576) may be conceptualised as a research method, as witnessing, which contributes to both more diverse knowledge production and research ethics. Taking other animals seriously as participants in knowledge production is also crucial for research ethics. This also requires attending to the contextual and political dependencies in human-animal relations in multispecies research, which influence more-than-human agency. At the same time, a researcher needs to be aware that there may exist unsolvable tensions and conflicts between human and bovine research subjects. Navigating ethical tensions in a manner that is respectful to all research subjects may require turning to relational, situated ethics. It also demands an approach that draws on embodied encounters between entangled, more-than-human beings (see Gillespie 2016, 573–574; Hamilton & Taylor 2017, 64).

Lonkila conducted interviews as part of her PhD project, which deals with changing breeding practices among dairy cattle in Finland. The data consists of nineteen interviews with dairy farmers. She first conducted six on-farm interviews and visits with dairy co-op officials, who also own dairy farms. In the second phase, she conducted thirteen telephone interviews with dairy farmers. She selected five farmers from these nineteen in order to conduct more detailed on-farm interviews and visits. Lonkila posted a call for interviews in a Facebook group for dairy farmers. In this call, she sought to attract the attention of farmers interested and invested in breeding. Seven farmers responded via this form of outreach. Six additional farmers were found via the suggestions of earlier interviewees. The farmers could decide for them-

selves who was the best person on their respective farms to answer questions related to breeding. Sixteen of the nineteen interviewees were women. In the interviews, farmers were asked to explain in detail how they make decisions about breeding and about which cattle they opted to send to be slaughtered. Farmers were also urged to demonstrate their decision-making processes in practice during these visits to the farms. This entailed going over the breeding plan with the farmer in their office, and then accompanying them whilst they carried out their work in the cowshed and/or pasture. This took up a whole day on some farms, while on others the visits only lasted a few hours. Lonkila's research topics also included the impact of breeding on cattle, as well as the care dynamic between farmers and cows. Interviews were recorded and farm visits were documented by means of field notes, photographs and videos.

Kaarlenkaski's fieldwork formed part of her post-doctoral research project on the effects of increasing technology on the practices of dairy husbandry in Finland. She focused mostly on Northern Savonia and North Ostrobothnia, where the majority of dairy farms in Finland are located. She contacted the dairy consultants of the local dairies in order to find appropriate interviewees who were using automatic milking systems. It turned out to be rather difficult to find interviewees in this manner, hence she also used personal contacts. She also initiated contact with two farmers after becoming aware of their appearances in the media. Kaarlenkaski conducted semi-structured interviews on nine dairy farms, of which four interviews were with one person and five were with two individuals. The latter type of interview usually involved the couple who owned the farm, although one set of interviewees were a mother and daughter. Nine of the interviewees were women and five were men. One of the interviewees was a cattle tender on a school farm.³ The interview discussions focused on the introduction and use of the milking robot and how it has changed the practices of cattle tending. In addition, the interviewees were asked to describe their views on what constitutes a good cow and what the cows should and should not do in the cowshed. After the interview, Kaarlenkaski briefly visited the cowshed with the interviewee(s), continuing the discussion and observing the practices of cattle tending, the behaviour of the cows and their material environment. The visits to the cowsheds were documented by taking notes, photos and recording short videos. All the interviewees are referred to anonymously and a running number separates individual informants.

After transcribing the interviews, both authors conducted a data-driven thematic analysis of the interview materials (see Braun & Clarke 2006, 83). In the case of Lonkila, the material was analysed as part of her doctoral stud-

³ To ensure his or her anonymity, this person is also referred to as farmer.

ies. Two of the themes that were recognised in the original analysis for her thesis are examined in closer detail in this paper: the breeding goals of the dairy farmers (where invisibility was identified as an important category) and human-animal relations on farms (where both resistant behaviour and affective relations were mapped). In our conversations with each other we found out that our material shared many themes and it would be useful to discuss these together. We decided to focus on the ideal of invisible cows, prevalent in both data sets, and elaborate upon this by proportioning it to the concepts of collaboration, resistance and affection. The analysis of our material was then deepened by a theory-driven approach, focusing on the appearance and conceptualisations of the above-mentioned themes (see Braun & Clarke 2006, 84). Although our exploration is mainly focused on the interviews, the role of personal farm visits, field notes and recorded audio-visual material was also significant for our understandings, as these helped to contextualise the discussions with farmers and widen our perspectives. Furthermore, our analysis of the interview material was deeply informed by the multispecies approach described above, and our aim was to pay special attention to expressions of bovine action and agency in the conversations.

Invisibility as Collaboration

Invisibility as a goal for livestock breeding emerged in Finland around 2008, together with developments in novel calculative breeding practices based on genetic and later genomic knowledge practices. These practices centre on the total merit index (NTM), which combines dozens of breeding values (animal traits) and presents farmers with a single number that denotes an animal's value. The largest breeding company in Finland launched a campaign to market this index with the following slogan: "We make cows invisible" (Lonkila 2017). The idea was that the company was able to produce a new type of dairy cow based on the new breeding value. The marketing campaign advertised the superior new breeding methods, which also delivered results for complex traits, such as health and fertility. The campaign also revealed a great deal about the values attached to contemporary dairy cows in the context of Finnish and Nordic dairy farming over the past decade. Invisible cows were healthy, collaborative and easily compatible with the changing practices on modern dairy farms, such as increased herd sizes and automated milking parlours. Farmers have less time to tend to each cow, so uniform herds, with individual animals that go unnoticed, are desirable as the cattle stay healthy, productive and fertile (NAV 2019). The so-called visible cows are animals that require additional care and attention from the farmer due to their individual characteristics (e.g., uneven udder structure, health or fertility problems, temperament). The



Detail from an advertisement for invisible cattle by VikingGenetics (*Nauta*⁴ 2011/4, 4).

values attached to an “invisible cow” have been crosscut within the context of dairy farming. Crucially, the company also redefined its customer – the Finnish dairy farmer – as part of its marketing campaign as a modern, independent and technologically savvy entrepreneur with an increasing herd size. The advertising campaign emphasised the need to “move from the milking stool to the calculator” (Lonkila 2017). Invisibility also has implications for the expertise of the farmer, both as a breeder and a caretaker. As cattle become a uniform, autonomous herd, the farmer can also move her focus from individual cattle to herd management. Breeding knowledge is outsourced to specific evaluation tools and indexes. Some farmers lament their loss of expertise and agency (Lonkila and Kaljonen 2018).

Thinking about the concept of invisibility from the perspective of posthumanist entanglements and the relational notion of agency shows that these changing demands for dairy cows are borne out of the simultaneous redefinition of both cows *and* farmers. Cows change because farmers change, and farmers change because cows change. Both developments are also influenced by other agents and networks of actors. It is crucial to examine the broader economic, political and social conditions in which the goal of invisibility emerges. Invisibility brings forth various new requirements for both dairy cows and farmers, and, as a result, requires novel forms of collaboration in their changing interactions on the farm. We suggest that the goal of invisibility is a significant departure from conventional conceptions about animal value and human-animal relations, which means that it is important to examine the associated modes of collaboration in relation to existing theories on the topic. In the following quotes, we let farmers define what invisibility means

4 The leading professional journal on cattle husbandry in Finland.

for them. Invisibility was often mentioned when interviewees described what they viewed as a good cow:

Interviewer: How would you describe a good cow?

Unnoticeable. (Farmer 30)

Unnoticeable. Not too big. This kind. (Farmer 29)

Medium-sized, agile. (Farmer 30)

Light structured and energy efficient. [...] it has the capability to eat and it easily goes to get milked. You don't have to do anything. (Farmer 29)

Like, you don't have to pay any special attention to it. (Farmer 30)

You just inseminate it. (Farmer 29)

Dry it off. [...] Take it to calve. (Farmer 30)

Yes, just that kind of, automatic, you don't have to – and then it is calm. Although you don't have to handle it, but then it doesn't become distressed when it is suddenly handled or taken to be monitored. A curious, calm cow. Those are really the best. The ones that you can steer by speech. (Farmer 29.)⁵

A good cow: I understand it to mean that you don't realise it's there, it does not cause you extra work. That way, I think, it's good for the cow as well, that kind of a goal, that she fits well into the herd and works well there. I believe that it is a good goal for both of us, both me and the cow, what they mean by invisibility. (Farmer 1.)

An invisible cow is unnoticeable, one that knows when to go to eat, knows how to go to the milking robot. And when you go and look [at the statistics] you realise that it gives a lot of milk, but it does not demand anything from you. When the basics are good, a cow does not need a human to be by its side. It does not need a human to tether it to the milking machine, the robot can do it because the udders are the right way and in the right place. [An invisible cow] can walk and moves well and eats well. (Farmer 16.)

The quotes above demonstrate that the goal of invisibility sets strict boundaries for modern dairy cows. In terms of physicality, an invisible cow should have good conformation, especially in relation to feet structure, as the cows walk a lot in the free-stall barns. Invisible cows also have high udders, with straight teats so that the robot can easily latch on. The invisible cow should also be healthy in every way: she should avoid diseases, such as mastitis, produce healthy milk (with a low somatic cell count), and have good, healthy hooves. She should be large enough so that the robot is able to efficiently milk her, but not too big, as very tall cows are more prone to illness and may struggle to fit in with the existing infrastructure of the cowshed. She should have a high

5 All quotations have been translated into English by the authors.

milking speed and a good temperament (not too social or too shy). The cow should be fertile and easy to impregnate, thereby contributing to a low calving interval. The invisible cow should also produce good-sized heifers and bull calves that do not die in infancy. Calving should also be easy. The cow should remain in the herd for a long time. Finally, she should produce a lot of milk with high levels of protein and fat content (VikingGenetics n.d.). An invisible cow should be carefree, inconspicuous and easy.

Invisibility creates extensive requirements for the cows. When cows remain invisible to the farmer, they are actively collaborating in the work of a modern dairy farm and the farmers' expectations of them. The farmer observes and monitors, and the animal delivers an unnoticeable, steady performance. Invisibility requires a lot from cows: they have to invest their "intelligence and affects" in their work (Porcher & Schmitt 2012, 55). Being invisible in relation to the farmer requires a high level of independence. Cows have to do the tasks required of them on their own in AMS and free-stall barns. When Kaarlenkaski asked the farmers to describe what the cows were required to do in the barn, the answers almost invariably included three aspects: eating, resting and going to get milked on a regular basis. These expectations indicate the ideal of invisibility and perfect collaboration from the human point of view. Deviance or failure in these tasks makes the cow "visible". An ill cow, for example, becomes noticeable because she only lies down.

One of the most crucial aspects of dairy farming is that cows are milked two or three times a day. In AMS farms, cows have to be able to interact with the robot in the correct way in order to fulfil these demands. The robot sends a notification to the farmer if an animal kicks it, if it cannot latch onto the udders correctly, or if an animal refuses to leave the milking station. Cows can also engage in other activities on their own on some farms, such as deciding if and when they would like to go outside.⁶ During these tasks, as in all daily activities in the cowshed, they have to be able to interact peacefully with other cows in the herd and to find their place in the social hierarchy. Farmers tend to be well aware of the social relations of cows, and heifers and newcomers have to adapt, or they risk becoming "visible" troublemakers in the eyes of the farmer. More than anything, cows have to learn to adapt to the increasing demands of production, to the changing technologies of the cowshed, to the environment and practices of the free-stall cowshed and to increasing herd sizes. More specifically, cows need to adapt to the monitoring devices that measure their "success" on all these terms. The tasks described above may be under-

⁶ There is no obligation in Finland, to pasture cows in free-stall barns, but some farms have a pen outside where the cows may go. In tie-stall barns, cows and heifers must have the opportunity to pasture for sixty days during summertime (Uotila 2017, 41-44).

stood as elements of animal work. As Despret (2013, 42-44) has argued, the work of animals often remains invisible when everything happens as it should. Nevertheless, this invisible work may be brought to the fore by engaging in a multispecies approach that we have applied in our research.

On the other hand, invisibility also brings requirements for the farmer. Invisibility not only demands investment in breeding and selection, but also in training the cows to interact within the herd and with humans. Cows have to learn to trust humans, but not to become too accustomed to them. It is important that cows retain a certain level of respect towards humans in order not to “walk all over them”, as one interviewee formulated the issue. Cows also have to be trained to go to the robot, to be inseminated and to accept treatment when ill, among other things. Farmers need to teach the cows all of these habits.

Importantly, invisibility also influences human-animal relationships on farms. Farmers perform “invisibility” in their own way. For example, as shown in the quote below, this goal makes it possible for farmers to choose to have a more distant relationship with their cows, physically as well as affectively. In contrast, some of the farmers that were interviewed specifically stated that they appreciated having more time to socialise with cows. The identity of farmers is in a state of flux due to the structural change of Finnish dairy production,⁷ coupled with the changing demands on dairy cows. As a result, the traditional understanding of dairy farming is being transformed and farmers have more room to tailor their work according to their own needs and wishes. For example, the younger generation may appreciate that automated milking and better monitoring systems give them more time with their families. At the same time, farmers have been encouraged to become increasingly business-minded as the pressure to increase efficiency is great in the circumstances of reducing

7 A crucial turning point in agriculture and dairy husbandry was the period of intense structural change between the 1950s and the 1970s. Because of more efficient methods and increasing mechanisation, the production rate of agricultural products rose quickly. By the 1960s, there was already an overproduction of eggs and milk in Finland. Consequently, agricultural politics started to favour a reduction in production and leaving agriculture, which resulted in the number of small-scale farms decreasing rapidly. Those farms that remained experienced a rapid increase in their size. Simultaneously, the remaining farms started to specialise in only one form of production, such as dairy farming. The number of people employed in agriculture diminished sharply. Structural change has accelerated since Finland joined the EU in 1995, with farmers having to adapt to EU regulations as well as the rules of the business economy, which both strongly affect the profitability of their livelihoods (Rasila 2004, 504–506). Contemporary intensive animal farming focuses on productive efficiency and increasing technology has been one aspect that has enabled this efficiency, resulting in the enlargement of farms and rising herd sizes (Raussi 2009, 150–152; Anthony 2012).

producer prices and rising production costs (Raussi 2009, 150–156). Invisibility is a goal tailor-made to meet all these conditions:

What I don't miss from the old ways, or what was idolised before, is that female farmers liked to be in the cowshed so much [...] and the animals, as individuals, were brushed every day. I don't miss that. The dairy production of today, or of the future, cannot be based on that kind of practice. It's more that I see that the animals are production animals, a means of production for us, and ones that we have to take the best care of as we can. That's more the approach I take. Of course, you walk in there and talk with them and pat them, but on our farm we don't stay there to socialise. And the cow does not need that either, because they are herd animals and it is more important for them that they get to act according to their own species. (Farmer 17.)

When farmers change, their animals must also change. Thus, invisibility can only be achieved through the collaboration of farmers and cows. And as with collaboration, invisibility takes a different shape in relation to each farm, each farmer and each herd. As mentioned, this collaboration does not necessarily signify a close relationship between farmers and cows. This, furthermore, does not signify that farmers are not interested or invested in improving the welfare of their animals. Although health, rather than welfare,⁸ is integral to invisibility, many farmers feel that changing human-animal relations on farms actually contributes to animal welfare:

[The goal of invisibility] is not any worse for the cow. The cow can live the kind of life it wants there in the cowshed, if it stays healthy. I think it can be even better [than the old ways]. The cow does not need the human to hover around it. It can live more like its own species. Be free in the free-stall barn, eat, and we ensure that it has the right kind of feed, the stalls are clean, the air conditioning is there, lights, all things like this. And if, despite all of this, the cow is, in a certain way, invisible ... I think it is good for the cow, then. (Farmer 17.)

At the same time, it is not obvious whether cows can participate in “emancipatory work”, as termed by Porcher and Schmitt, within the parameters of invisibility. By emancipatory work Porcher and Schmitt mean labour that heightens the sensibilities and develops the capacities of the worker. Whether

⁸ Although animal welfare and the definition of it are highly contested issues, health is often seen as a crucial aspect. Animal welfare is a more comprehensive concept, including, for example, the feelings of the animal and its capability to adapt to its environment. For a more thorough discussion on the development of the concept of animal welfare and different understandings of it, see Broom 2011.

this type of work can occur in a cowshed is strongly dependent on the organisation therein (Porcher & Schmitt 2012, 57–58). The extent to which infrastructure and the conditions of production allow for animal play – an indicator of animal welfare (Held & Špinka 2011) – differs, for example, on each farm. In fact, as we will show in the next section, various playful activities can compromise the invisibility of cows if the infrastructure does not facilitate such playfulness. Furthermore, it is noteworthy that the capacity of cows to affect their lives and circumstances is severely limited. Before the invisibility of a herd is achieved, a strict selection process needs to take place. While certain cows perform well and remain invisible, others do not. It is also important to remember and attend to these animals in research.

Invisibility and Resistance

One cow [...] calved for the first time, it had to be driven to get milked, it wouldn't go [to the robot] by itself, and a horrible trapeze jumping [i.e. wild kicking and jumping] started there [...] I don't remember how many months we looked at that, at least two to three months, so it should have become accustomed to it in that time, [...] but it wouldn't, we thought that it is so horrible to that cow that it is better to put the cow down. (Farmer 22.)

It is difficult to know for sure why the cow acted in this way in the situation described above. The farmers waited for the cow to adapt to the robot for a long time, but eventually decided to cull her, because she seemed to be suffering from being placed in such a situation. There are countless examples within our empirical material of cows who failed to stay invisible in one way or another. As a result, they have been culled. Included among these cows were those who were infertile, sick, angry, skittish, or lame, but also those that simply failed to adapt their behaviour to the new practices within the cowshed. Some cows never adapt to the new milking systems or the free-stall barn. Such problematic “visible” cows also include those whose physical bodies are not suitable for the AMS, which includes cows who have crossed teats. The quote above highlights the power relations in cowsheds: if an animal “resists” the milking system, farmers can decide to remove it, and move forward with other animals who are better able to adapt.

Scholars have turned to the concept of more-than-human resistance in order to highlight the plight of other animals within the animal industrial complex and the uneven power relations therein (Gillespie 2015; Morin 2015; Best 2014). We agree that attention to such resistant acts can be helpful in emphasising both more-than-human agency and power relations between humans and animals. At the same time, there is a risk that focusing on resis-

tant acts, such as kicking or attempts to escape, may overlook more passive forms of resistance. Gillespie argues that scholars should take care not to valorise physical acts of resistance: the fact that such acts cannot be identified does not mean that the animals are happy (Gillespie 2015, 129). Does a lack of resistance signify collaboration? Are cows who successfully remain invisible collaborating, or simply not resisting?

We argue that this question is not meaningfully solved by either answer. First, the concept of resistance can be problematic in itself as it indicates intention behind actions (for an extended discussion on agency and intentionality see Bear and Holloway 2019). Furthermore, a focus on resistance challenges the understanding of agency as inherently entangled and relational in a problematic manner, as it frames resistance as one agent's actions against another or the broader system. We also take a critical position towards Porcher's view of collaboration (2015, 4), according to which "if an animal does not want to work, she does not work", and hence the work cannot be done. While this is true at face value, it hides from view the relations within farming that make this statement possible. If an animal refuses to participate in work, she is first encouraged to do so with varying methods, some of which can be violent. If an animal is particularly stubborn it risks being culled, while the farmer continues to work with other animals. In previous sections, we have explored how the demands on cattle have changed. We argue that it is important to understand how cattle do or do not adapt to them. Exploring bovine resistance can help to contextualise invisibility and to analyse its impact on cattle.

To move away from the understanding of resistance as a series of linear, intentional actions, Bear and Holloway (2019) have introduced the concept of relational resistance. They build on the earlier work by Holloway and Morris (2012, 67), in which resistance is perceived as "capillary", that exists "already alongside power", presenting alternative knowledge, ethics, and practices against those established by a regime. Building on the Foucauldian theory of biopower (see e.g., Foucault 2008), Holloway and Morris have developed the concept of "heterogeneous biosocial collectives", around which humans and nonhumans gather within agricultural systems. Within these collectives, resistance exists as multiple and complex tensions and contestations. These collectives gather around shared knowledge practices, but are not characterised by a shared will. Neither human nor non-human resistance necessarily takes shape as a complete rejection of those knowledge practices, but as relational resistance within the collective (Holloway & Morris 2012, 65).

We argue that actors pursuing the goal of invisibility form one such "heterogeneous biosocial collective", where humans, cattle and various technologies come together around this aim, and the associated knowledge and practices within contemporary dairy production. The concept of relational resistance

allows us to highlight the incongruous ways in which animals participate in negotiating the concept of invisibility. In the following paragraphs, we identify manners through which cattle resist invisibility in a capillary, relational way. We speculate that this resistance comes to characterise invisibility at a fundamental level, highlighting its unattainability.

First, we perceive the biological characteristics of dairy cows as possessing the potential for relational bovine resistance. Twine (2010) has explored how nature can “bite back” in the course of the biotechnological enhancement of animals. The recent history of dairy cattle breeding involves one such example: the unexpected negative correlation between high milk yields and fertility (Berry, Friggens, Lucy & Roche 2016; Oltenacu & Broom 2010). Fertility is the most valuable trait of dairy cows – they can only produce offspring and milk if they are repeatedly pregnant. Although breeding plans have been adjusted to ensure the highest levels of fertility, infertility issues persist. Cows who require multiple inseminations or hormone treatment fail to remain invisible. It is not meaningful to perceive infertility issues as individual, intentional acts of resistance from cows. Instead, they portray the complex contestations inherent in heterogeneous biosocial collectives. Such resistance is fundamentally relational, as it emerges out of collective more-than-human work on bovine bodies. Farmers also take different approaches towards solving fertility issues: some turn to upgraded breeding plans, hoping that the next generation of animals will be improved (complemented by removing less fertile animals). Other farmers argue that infertility can be combatted through adjusting farmers’ practices and engaging in better care: increased farmer involvement, closer monitoring of heat periods, or better insemination practices.

High milk yields are also problematic in terms of invisibility. Several farmers mentioned that they do not select cows that have extremely high milk yields, as such cattle are more susceptible to illness (e.g., mastitis). These cows are also not adaptable: when the milking robot is under regular maintenance, the cows do not handle it as well as average cows. High-yielding cows require more care as their biological processes are pushed to the limits and are easily rendered out of order. This bovine resistance ties together the increased economic pressures of farmers and the biological limits of cattle, continuously tinkering with the definition of invisibility and a good dairy cow. This may be understood as unintentional bovine resistance that also reveals the tensions between the views of regarding cattle welfare and longevity, when compared to how the lives of cows are valued and how their economic worth is measured at the industry level. The physiques of the cows are also resistant to the milking system in other ways. Cows that have irregular udder structures become visible from the herd, and, in some cases, the farmers have to “assist” the ro-

bot during the milking process.⁹ On the other hand, interviewees pointed out that milking robots “learn” astonishingly well and are able to adapt to different types of udders, because new data is constantly updated to the computer operating system of the robot.

Finally, we argue that animal behaviour can also be perceived as a relational form of resistance. The quotes below indicate that farmers may see cattle’s playful behaviour as a nuisance, especially when the animals are too curious for their own good, thereby hurting themselves and breaking things in the cowshed:

[...] when [the cow] has time and it wants to entertain itself, and heifers and calves too, wherever there is something loose or a cup is sloshing or a door handle or whatever, so it’s like, it’s a way of passing the time, for the animal. Or licking a door or something, or gnawing. It doesn’t necessarily end if you throw a licking stone in there [...] The animal likes to get into mischief every now and then. (Farmer 27.)

[...] there are occasions, they may scuffle over something, something happens, for example a collar lodges itself in an unusual place, so that the cow is about to hang itself or something, we have tried to eliminate these places, but the cows are so great that they will, well, human reason is not fast enough for them, as they find all kinds of notches. (Farmer 22.)

The farmers we interviewed explained that they are continuously trying to locate dangerous places in the cowshed but can never outwit their cows. When they play and cause a nuisance, cows are not doing what they are supposed to do – eat, sleep and milk. Farmers attempt to limit and direct animal play to licking stones or cattle brushes, but these appear to be inadequate stimuli for cattle. It is apparent that cowsheds are not suitable for animal play, in the sense that the structures can be dangerous and cause harm to the animals. Nonetheless, when animals engage in playful behaviour, these actions can be perceived by the farmers as acts of resistance against their collaborative work. At the same time, these acts of resistance can be very meaningful for the farmers, as they display the personality of the cows and invite affectivity.

Invisibility and Affection

Farmers commonly seem to accept and support the ideal of an invisible, autonomous cow, but frictions do exist in this mode of thought. As several re-

⁹ If a cow possessed udder structures that were problematic for the AMS, farmers could put slabs of plastic under the hind legs of the cow in order to elevate her, or use a stick to move the teats into the proper position.

searchers have argued, affective and interactive relationships with the animals are often described as important for dairy and beef farmers (see, e.g., Wilkie 2010, 133; Porcher 2006, 69; Ellis 2014; Kaarlenkaski 2014). This was also evident in our material. It is impossible to maintain emotional relationships with every cow in large herds, but there are usually certain individuals that stand out and receive special attention:

There are so many personas. In every group of heifers there is usually one that is over-friendly. In the cow section there are also many cattle who follow you while putting litter in the stalls and they push their heads under your arm. So, there are really many [cows] that bring themselves forward. (Farmer 24.)

These cows cease to be invisible owing to their individual character or distinctive behaviour, that is, the cows themselves affect the way in which they are perceived by farmers: they “bring themselves forward”. As Buller (2013, 156) has suggested, affective relationships on animal farms “are complicated by an enduring duality, that of the animal as individual and the animal as multitude/herd/mass. In livestock farms, animals are both ‘one’ and ‘many.’” This contradiction was seen in the farmers’ discourse: they could speak of the average value of milk yields, breeding values or the number of calves born to each cow, and in the next sentence, they could refer to the individual traits of certain cows. The simultaneous understanding of “one” and “many” seems to be a constant feature of contemporary dairy farms in Finland.

Moreover, it is not possible in the practices of contemporary farm work to view cattle as an indistinguishable mass. Cows need to be easily identified when they have to be inseminated or treated for medical issues. The animals are distinguishable by their individual ear tag numbers, and many farmers use these numbers rather than identifying them by name. However, some farmers in possession of over a hundred dairy cows emphasised that they recognise each cow individually, and even remember their names and use them on a daily basis. The farmer in the following quote owns 160 milking cows:

In my opinion, our cows are still individuals, although there are so many of them [...] we call our cows by names, we know their characters, they are so different. Many people ask how I can remember all of their names, and I answer that you get to know them one by one. I don’t have to learn their names all at once, which would be quite a task. They come to me little by little, and then they come again to be milked as heifers in turn, and when you spend time every day with them I don’t think that it is a problem to recognise them as individuals. (Farmer 25.)

The cows have individual numbers on their ear tags, and it is not mandatory to add a name in the official register. However, it is customary to name at least the female calves on contemporary Finnish dairy farms. There is a long tradition of naming cows in Finland. It can be argued that people tend to become more attached to animals that have individual names (Phillips 1994; Kaarlenkaski & Saarinen 2013). Moreover, it was mentioned in the interviews that the farmers often use both a name and an identification number for each animal in their everyday routines. Hence, the Finnish farmers we interviewed maintained the traditional practice of naming individual cows as it was still meaningful to them.

Many interviewees also stated that they have favourite cows in the herd, who are not necessarily the best milk producers nor the most invisible. On the contrary, as one interviewee pointed out: “There are favourites. I don’t understand why some of them have become favourites, but maybe it is their persona or something. They aren’t, they really aren’t the best cows. [Giving a laugh] In no way” (Farmer 26). The position of a favourite cow may be linked to family relations and emotional attachments between people, as in the excerpts below, or to certain bovine families that have a long history on the farm:

Of course, you get some cows that you forgive a lot, like your child’s favourite cow, or some quality in them, that you forgive all kinds of faults ... that you should have culled them many times over. You always have those cows that when you start to really look, you realise it’s crazy to keep an animal like that. But there’s no law against that! [laughing] Those animals are in no way invisible and are not the most productive ones either. But there has been some other point in them that makes me think they’ve got to stay. But you shouldn’t have too many of those. (Farmer 19.)

[...] certain cows are forgiven quite a lot. We wouldn’t be so flexible to all of them [laughing]. [...] But just this cow Enne, who is our oldest cow, she was born on the same day as [name of the interviewee’s child], [...] a couple of hours before we started off to the hospital I still went to help a cow in calving, so it is impossible to put down such a cow [laughing]. (Farmer 20.)

In the material collected by both authors, even “retired” cows were mentioned. These cows did not milk anymore, but they were allowed to stay in the herd as long as they stayed healthy because they were special in some sense (see also Porcher 2015, 11). It is evident that the ideal of invisibility is not easy or self-evident even for farmers, as they usually appreciate having some kind of emotional relationship to the animals. This affectivity prevents certain cows from remaining invisible. However, it is important to remember what

the farmer in the first quote above points out: due to financial actualities, it is not possible to have too many favourite cows that have privileges, and decisions may not be based on emotions with every cow.

In addition to affective relationships with certain individual cows, it seems that reciprocal interactions with the animals in general are significant for many farmers. Some of our interviewees stated that cows are scratched and patted even more in the free-stall barns than in the tie-stall barns because there is more time to walk among them and observe them. This may also be the part of the farmers' work which makes it significant:

Interviewer: Do you have time to scratch the cows there?

Yes, yes, it is the best part of the work in my opinion, although you can't spend much time doing it. But I like it when you bustle around there and clean the stalls and look for a cow that needs to be treated, for example, and at the same time you socialise with the cows. Some of the cows like to come and chat with you, and they come and greet you and wait for you to scratch them; and some of them couldn't care less. [...] I certainly like to bustle around with them. And they say that if you are going to build a big barn with a lot of cows, and specifically a free-stall barn and robotic milking, you have to like cows, otherwise the work gets difficult, if you don't like them, it gets hard. (Farmer 25.)

The farmer cited above, along with some others, emphasised "socialising" as a method for making cows easier to handle. She pointed out that when the animals become accustomed to the presence and touch of human beings from a young age, they become "easy workmates" and are collaborative. This could be framed as trust:

And I feel that it is very rewarding moment in this work, when you get a cow to trust you; one that maybe hasn't trusted you earlier, or you didn't know whether it trusts you that much or not. That I can treat it there when it is free. (Farmer 25.)

Similarly, Porcher (2015, 12) has argued that affection between humans and animals is "a necessary condition for sustainable and secure work relations". On the other hand, perceptions vary and there are farmers who do not appreciate close contact with cows. Indeed, they view this type of behaviour as a nuisance: "we don't want the kind of cows that are constantly attached to your sleeve or come to lick you" (Farmer 17).

Based on our fieldwork, we strongly agree with Bear and Holloway (2019, 215), who have pointed out that even in large herds cattle may be understood as both "machines" and "friends" (see also Wilkie 2010; Ellis 2014). However, farmers have great power over the lives of their animals, and hence the friend-

ships that they develop with their livestock are completely different from relationships between humans (Porcher 2015, 11, 15). As the discussion above shows, “friendship between humans and animals [...] is managed between too much and not enough”, as Porcher (2015, 11) puts it. Too close a friendship and too much emotionality with a farmer’s cattle would risk the profitability of her/his livelihood, but total alienation from the animals or the invisibility of the cows is not desirable either. The farmers must constantly negotiate between emotional attachment and the pressure for higher profitability. The contradictions between the business model and way of life and the joy of work and stress, as well as developing an interest in animals and using them as a source of income are manifested in the following quotations:

[...] although this is work, this is also a passion, or a matter of choosing your way of life. You should like animals if you are going to do this. I don’t believe that it would be possible to succeed in milk production if you are totally disinterested in animals. (Farmer 20.)

Cows are my colleagues. They are important. Their welfare is important. You really have to like them, although they are so annoying at times. [laughing] They are a lot of work and they make you worry, and you have to stay up all night sometimes, but they give you so much joy as well. And they are our income. That’s how we pay our employees. We have no other source of income than milk. (Farmer 18.)

As seen in the above quotations, affection may fall upon the cows and the herd generally, not only on certain individuals, as well as on the mode of life on the farm as a whole (see Buller 2013, 170).

Conclusion

In this paper, we have discussed the multispecies and multidirectional relationships that are formed on contemporary technologised dairy farms. Focusing on the concept of “invisible cows”, and how these kinds of cows are produced and represented on the farms enabled us to discuss the contradictions between ideals and practical work in dairy husbandry. As we have shown, the goal of invisibility sets demands on both the animals and the farmers – and their actions on each farm are tightly entangled. Our discussion of everyday work on dairy farms reveals the unattainability of invisibility. In various ways cattle resist their enactment as see-through members of the herd. For example, they often fail to work well with the milking robot, or the pressures of high production break their bodies in a way that forces farmers to care for them constantly. At the same time, invisibility can also be resisted by farmers who embrace

their relations with specific animals who fail to stay invisible. This highlights the affective agential possibilities of cattle. The project of making cows invisible ends up revealing the inherent uncertainty and unknowability of cattle.

Our discussion shows that the theoretical concepts of animal collaboration, resistance and human-animal affection, often used to analyse the relationships between humans and (farm) animals, fail to grasp the complexity of more-than-human agency on farms. First, modes of collaboration tend to include resistance and affection simultaneously. Furthermore, these modes are strongly entangled in the uneven power relations of dairy farming: animals that fail to collaborate, either in their behaviour or physical traits, are removed from the herd. Second, resistance is often not a self-evident reaction of one actor against the other, but a relational process in which many agents, both human and non-human, take part. Finally, although the affective dimension is still an important factor for contemporary farmers, it has become increasingly controlled. It can exist in relation to a small number of specific individuals, but not on the scale of the herd (see Buller 2013, 170). Although some favourite cows may have privileges and the demands for their productive performance may not be as strict as with other cows, the increasing economic pressures are continuously narrowing the space for affective relations. At the same time, the existing affective relations continue to hold much meaning for farmers. Some farmers, who perhaps value such relations less, speculate as to whether it is animals or humans who benefit more from close human-animal relations.

By adopting a posthumanist approach in our fieldwork and analysis, we have displayed the intertwining agencies of humans, animals, technologies, material environments and agricultural, as well as economic, policies (see Calvert 2018, 74). These networks of actors may be understood as heterogeneous biosocial collectives, within which resistance may occur not as total rejection, but as a state of constant conflict and challenges. These contestations are manifested, for example, in the unexpected biological reactions of bovine bodies to breeding goals. Humans have the power to decide the fate of their animals in an agricultural context. Yet, on many occasions this power is also distributed and humans have to respond to the behaviours and physiologies of animals. With a multispecies framework, we have contributed to a more complex understanding of the intertwined human and animal agency within dairy husbandry, in which both collaborative and resistant practices and knowledge are always entangled.

It is predictable that the size of Finnish dairy farms will continue to grow drastically as the number of existing farms decreases. With increasing herd sizes, the ideal of invisible, independent and easy-going cows is likely to prevail. We suggest that ethical questions will become more and more important

as this development continues. First, invisibility inevitably transforms traditional concepts of close human-animal relations within dairy husbandry. Second, the ideal of invisibility poses fundamental ethical questions vis-à-vis our relations with other animals. In aiming to attain total control of animals, invisibility reduces the “otherness” of animals and fully subjugates them to human control (see Galusky 2014, 945). The goal of invisibility, which aims to create cows that are as autonomous and efficient as possible, presents the ultimate technological fix to the many messy issues of entangled human and animal relations on farms. For example, “resistant” bovine biological traits come to be seen as temporary hurdles on the path towards more streamlined animals – rather than raising fundamental concerns about animal welfare or ethical questions about the goals of animal breeding and production. As Bear & Holloway (2019, 213) have suggested, the increasingly technologised nature of dairy husbandry has not, to this day, created a “bovine utopia”, where cows would have the freedom to make decisions about their own lives.

ACKNOWLEDGEMENTS

We are grateful to The Academy of Finland (project numbers 296488 and 323756; Kaarlenkaski) and the Doctoral School of The University of Eastern Finland (Lonkila) for funding our research.

We would like to thank the interviewees, and the two anonymous reviewers for their supportive feedback and insightful comments.

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Farmer 2, male, January 2015, Northern Savonia, 20–59 dairy cows.
Farmer 3, female, January 2015, Northern Savonia, 60–99 dairy cows.
Farmer 4, female, January 2015, Kymenlaakso, 20–59 dairy cows.
Farmer 5, male, January 2015, Pirkanmaa, 60–99 dairy cows.
Farmer 6, female, January 2015, Pirkanmaa, 100–150 dairy cows. Second farm visit September 2016.

Annika Lonkila, phone interviews and farm visits:

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Farmer 8, female, March 2016, Northern Savonia, less than 20 cows.
Farmer 9, female, March 2016, Northern Savonia, 20–59 cows.
Farmer 10, female, April 2016, North Karelia, 20–59 dairy cows.
Farmer 11, female, April 2016, South Ostrobothnia, 20–59 dairy cows.
Farmer 12, female, April 2016, South Ostrobothnia, 20–59 dairy cows.
Farmer 13, female, April 2016, North Ostrobothnia, 60–99 dairy cows.
Farmer 14, female, April 2016, Kymenlaakso, 20–59 dairy cows.
Farmer 15, female, May 2016, Kanta-Häme, 20–59 dairy cows.
Farmer 16, female, May 2016, South Karelia, 60–99 dairy cows. Farm visit conducted in August 2016.
Farmer 17, female, April 2016, Northern Savonia. 60–99 dairy cows. Farm visit conducted in August 2016.
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Farmer 20, female, and Farmer 21, male, married couple. November 2018, North Karelia, 60–99 dairy cows.
Farmer 22, female. November 2018, North Ostrobothnia, 60–99 dairy cows.
Farmer 23, female, and Farmer 24, female, mother and daughter. November 2018, North Ostrobothnia, 60–99 dairy cows.
Farmer 25, female. November 2018, North Ostrobothnia, over 150 dairy cows.
Farmer 26, female. December 2018, Northern Savonia, 20–59 dairy cows.
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