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Abstract

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Keywords

milking machine, technology, cows, gendered division of work, agency, dairy farming

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Abstract: *During the last hundred years, mechanization has significantly changed the working circumstances of both humans and animals in cattle husbandry. In Finland, cattle tending was regarded as women’s work up until the mid-20th century. According to a common view, the proliferation of milking machines, starting from the 1950s, caused men to start working in the cowsheds. In this paper, I will examine how the agencies of cattle tenders, cows, and milking machines were constructed during the mechanization process from the 1950s to the 1970s. Special attention will be paid to gendered representations, and changes in the gendered division of work. The main materials used in the study consist of answers received to two ethnographic questionnaires, organized in 1969 and 1992, which dealt with the mechanizing and changing agriculture. The focus is on the questions concerning the introduction of the milking machine, which were included in both questionnaires. In addition, two contemporary machine milking guidebooks will be examined. In accordance with new materialist theories and cultural studies of technology, meanings attached to gender, technology, and animals are seen as relational and intertwined. The article foregrounds agencies that are usually invisible in animal husbandry, and argues that cows participated in the domestication of milking machine technology along with humans.*

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Introduction

Dairy husbandry is nowadays mechanized in many ways: strenuous manual work in feeding, milking, and manure removal has been replaced with automated technology. The mechanization development began with milking machines, and they started to become common in different parts of the world during the first half of the twentieth century. Driessen and Heutinck have estimated that since the 1960s most cows in the western world have been machine milked (3).¹ In Finland, however, the mechanization of cattle tending did not properly start until the 1950s. According to the statistics, in 1950, approximately three per cent of Finnish farms that sent milk to dairies owned a milking machine. By the end of the decade, the proportion had increased to nine percent, and in 1969 to 28 percent. In 1983, almost 80 per cent of farms had a milking machine (*Suomen virallinen tilasto* 1950; 1959; 1969; *Maatilatilastollinen vuosikirja*). Thus, in three decades the milking machine had turned from a rarity into a common device.

In Finnish agriculture, the gendered division of labor, which has its roots in agrarian culture, was fairly strict until the mid-20th century. Cattle tending, particularly hand milking, was regarded as women's work, whereas men worked mainly in the fields and forests (Siiskonen, 'Maatila yrityksenä' 301).² According to a common view, it was the introduction of milking machines which caused men to start working in the cowsheds (see also Morell 386). Though the implementation of a bucket milker changed the practices of cattle tending remarkably, this process has been under studied both in Finland and internationally. For example, in Finnish research this phase has usually been passed over quickly by stating that milking machines made dairy husbandry easier and also brought men into the cowshed (for instance, Nevala-Nurmi 201; Siiskonen, 'Maatila yrityksenä' 303; Rasila 505). Recently, Richie Nimmo has studied the development process of the milking machine in the late nineteenth and early twentieth century ('The Mechanical Calf'), and Mats Morell has discussed early milking machine advertisements in Sweden, but the practical implementation of the machine on the farms has scarcely been explored in the humanities or social sciences (see also Holloway and Bear 217).³ Although several wide-ranging volumes discussing milk and milk consumption from historical, societal, and material perspectives have been published recently (for example,

Valenze; Smith-Howard; Atkins; Cohen and Otomo), the grass-roots level viewpoints of cattle tending and milking have been dismissed. Certainly, cows have been recognized as focal actors in the process of milk production (see Atkins 113), but usually their actions are only briefly mentioned.⁴ In feminist research, however, the bodily experiences of cows and their marginalization in dairy industry have been discussed, and particular attention has been paid to their exploitation (for example, Adams 23-24; Gaard 217-219; Otomo 223).

In this article, I will study the introduction of milking machines on Finnish farms from a multispecies perspective. How were the agencies of cattle tenders, cows and milking machines constructed during the mechanization process from the 1950s to the 1970s? I will pay special attention to gendered representations, and transformations in the gendered division of work. Following the ideas of Porcher and Schmitt, I understand animal husbandry and milking as work in which both humans and animals participate. The materials used in the study consist of answers sent to two ethnographic questionnaires, organized in 1969 and 1992, as well as two machine-milking guidebooks. In the next section, I will present the theoretical framework of the study, followed by a more detailed description of the research materials and methodologies. Subsequently, the historical context of the study will be elaborated. The empirical analysis will begin by discussing the novel agencies made possible by milking machines and is followed by a discussion of the relationships between cows and milking machines. The concluding section will summarize the most significant theoretical and empirical findings of the study.

Perspectives on the Agencies of Animals and Technology

The theoretical framework of the study is inspired by new materialist thought, human-animal studies, and cultural studies of technology. New materialist theorizing emphasizes that embodied humans are essentially part of the material world, and it discusses materiality as an integral part of communication (Coole and Frost 8-10). Feminist accounts of new materialism have foregrounded the inseparability of object and subject, materiality and discourse, bodies and their environments, and human and non-human beings. As Manuela Rossini has suggested, human and non-human bodies interact constantly with each other and their environment, and

they construct each other through relationships and dynamic effects. As she further notes, these approaches also grant agency to both human and non-human biological bodies, defining ‘corporeal matter as (co)creative’ (16-17). Accordingly, meanings attached to gender, technology, and animals are seen in this study as intertwined and relational. Following Donna Haraway (11-12, 15-16), cattle are understood here as a *companion species*, because they have lived in close contact with humans for millennia and contributed to mutual relations of the two species. Humans and cattle have had to adjust to common surroundings and also to learn to understand each other’s communication (Kaarlenkaski, ‘Kertomuksia lehmästä’ 237-41). Moreover, practices of cattle husbandry are formed in multispecies communities comprised of humans, animals, technologies, plants, bacteria, and buildings, to name a few (see van Dooren et al. 2-4).

Thus, in this article, agency is understood as relational and it also encompasses non-human actors (see Coole and Frost 8-10, 20-21). Philosopher of science Vinciane Despret has argued that agency is always formed in relationships, in ‘a flow of forces’ constructed by multidirectional relations of effects. The parties of the relations are interlinked, and they instigate and stimulate each other to become agents in their reciprocal relationships, which Despret calls ‘interagencies’ (38-41, 44). Moreover, according to Chris Pearson, animal agency takes different forms. They may shape their environment, for example, by contributing to or precluding historical processes intentionally or unintentionally (15). As Gary David Shaw has suggested, agency may be understood as a continuum of actions, on which human as well as non-human beings move (165). Both Despret and Pearson have reflected on the view, shared by some researchers (for example, Philo and Wilbert; Hribal) that animal agency manifests itself mainly through resisting human actions upon them. As Pearson has pointed out, reducing animal agency to resistance contrasts humans and animals unnecessarily, and may undervalue occasions when animals support human endeavors (14). Despret, for her part, has suggested that the agency of animals is often ignored when animals do what is expected of them. According to her, this demands active collaboration and assent from the animals. Animals may be seen as ‘secret agents’ whose actions and relational impacts often need to be unearthed from historical accounts (42-44; see also Shaw 165). In this paper, particular attention will be paid to this perspective.

However, analysis focusing on relations does not presume that all the participants – such as humans, animals, and machines – are understood as similar to each other. According to Lewis Holloway, agency, subjectivity, and bodily capabilities should be understood as produced by historical sets of relations instead of essences that are brought into relationships as such (1045). Nimmo has pointed out that unlike machines, animals are not built by humans, although in many cases they are involved in the same cultural and material environments (*Milk, Modernity* 6, 38-39). Machines, on the other hand, may be seen as including human agency, intentions, and values because they are made by human beings (see Latour, *Pandora's Hope* 190; Michael 131). Nimmo has investigated the development process of milking machines from a new materialist perspective. His aim was to find out how the bovine body is entwined with other sets of relations and forces, and to trace the abrasions and reverberations that are formed in these encounters. Nimmo has also criticized understandings of technology as an 'instrument of anthropocentric or speciesist oppression, of patriarchal domination, of capitalist exploitation, or of biopolitical subjectification.' Instead, he has proposed seeing technologies 'as socio-material devices that mediate the relations of humans, nonhumans, organisms, substances and forces with which they are entangled' ('The Mechanical Calf' 84). In this article, I aim to follow this theoretical framework, and apply it to the practical implementation of the milking machine on Finnish farms.

The most urgent problem in the development of milking machines was the reconciliation of living beings with complex and varied physical traits, and standardized mechanical apparatuses (Nimmo, 'The Mechanical Calf' 85, 91). The development process of the machine started in the early nineteenth century simultaneously in different countries, and several methods to empty the udder were tried. In the 'milk tube' design, a narrow tube or catheter was inserted into the teat, so that the milk would flow out of the udder and through the tube into a container. Pressure machines, on the other hand, were supposed to simulate hand milking. They compressed the teats by rollers and pressure plates, in order to stimulate the flow of milk into a connected tube. Machines operating by continuous suction were also tried. All of these machine types turned out to be unusable in the long run because their output was low, and importantly, they injured the udders and teats and exposed the cows to inflammations and other serious

conditions. Thus, the recalcitrant bovine bodies affected the design of the milking machine (Palva 20; Jansson 5, 7-8; Nimmo, 'The Mechanical Calf' 86-92). What proved to be crucial was the invention of the pulsator in 1895. Pulsator machines create a suction that is not continuous but intermittent, and this simulates the suction a calf creates by his or her mouth. Compared to the earlier models, pulsator machines were also a commercial success, and the same principle is still in use in milking machines (Palva 20-22; Nimmo, 'The Mechanical Calf' 93). Thus, the milking machine is a particularly interesting technology as it has been designed to simulate nature, the suction of the calf. Taking bovine physiology into account was unavoidable in order to create a workable machine.

Gendered agencies are also related to technology. In western cultures, masculinity and technology are seen as entwined: men are often self-evidently presumed to be interested in machines, using them and repairing them. Working with technology may have been difficult for women, and women may have been reluctant to participate in technological work because of the masculine connotations (Wajcman 89, 137, 152-153). Also, the design of technology has been a masculine activity. For example, the milking machine was mainly developed by men, although hand milking was for the most part conducted by women (Nimmo, 'The Mechanical Calf' 87). However, as several researchers have argued, technologies may be gendered in different ways (Wajcman 89-90; Oudshoorn et al.). In my previous study on milking machine advertisements, I found that traits of both agricultural machinery and domestic appliances were attributed to milking machines. They were described as containing complicated technology, as 'masculine' agricultural machinery, but at the same time they were assured to be very easy to use, as 'feminine' domestic appliances (Kaarlenkaski, 'Lypsäjät, lehmät'). In addition, taking into account the multispecies perspective to gender and technology, milk production and milking may be seen as gendered activities as they affect only female bovine bodies. The consequences impact both male and female calves, however, as they are separated from their mothers shortly after their birth to enable milking of the cow (see also Adams; Gaard; Otomo).

Research Materials and Methodologies

The essential materials of this study consist of answers received to two ethnographic questionnaires. The first questionnaire, entitled *Maatalouden koneistuminen II* (Mechanisation of Agriculture II) was organized in 1969 by the discipline of European Ethnology at the University of Turku. The second, entitled *Muuttuva maatalous* (Changing Agriculture) was organized in 1992 by the Ethnological Archive of the Finnish Heritage Agency. My focus is on answers to questions concerning the introduction of the milking machine, which were included in both questionnaires. The first questionnaire from 1969 emphasized collective perspective, which has been typical for ethnographic queries (see Olsson 40). The aim of the questionnaire was to discover when different agricultural machines became common in the home regions of the respondents. The milking machine was discussed briefly in the list of questions: ‘When was the milking machine introduced? How common is it now on farms of a different size?’ (TYKL, Tiedusteluja n:o 37). The questionnaire garnered 261 answers, and all the responses to the questions regarding the milking machine are included in the research material.

The second questionnaire from 1992 was directed at farmers and their family members, living on either big or small farms. The respondents were asked to write about their first-hand experiences (*Museoviraston kyselylehti 1992*, 56). The questionnaire included 104 questions, and most of them had a list of sub-questions. The most relevant questions for this study were listed under the section on dairying, and these enquired about the moment when the milking machine was acquired, why it was bought, on whose initiative, and how it changed the handling of the cows and time spent in milking. In addition, there were questions about the gendered division of work in animal husbandry, and possible changes to it (*Museoviraston kyselylehti 1992*, 23). More than 850 people sent their responses to this questionnaire (*Museoviraston kyselylehti 1994*, 1). I have read approximately half of the material, thoroughly scrutinizing the answers to the questions described above and cursorily reading responses to questions regarding mechanization in general, decision-making, and division of work on the farms. Having read nearly 700 responses, it must be noted that a large proportion of the respondents described the issues rather briefly, which is typical for materials collected by ethnographic questionnaires. For example,

many informants reported merely the year the milking machine was acquired by their farm, which was often followed by a remark that it made milking work easier. Luckily, there were also sufficient respondents that described their experiences more eloquently.

In addition to ethnographic materials, I will discuss two machine-milking guidebooks, published in 1951 (Palva) and 1969 (*Konelypsyn opas*). These books shed light on the perspectives of milking machine manufacturers and dairy farming educators. I have analyzed all the materials with qualitative content analysis, organizing them thematically and gathering the most essential accounts, focusing on the representations of agency and gender (see Julien). However, following the ideas of Shaw, I have aimed to avoid presuppositions about the nature of agency of, for instance, animals and technology, and to foreground the formations found in the materials (165). The analysis may be characterized as material-discursive reading, which aims to scrutinize the connections of materiality and human and non-human animals as well as the meanings entwined with them (see Kaarlenkaski, 'Lypsäjät, lehmät').

Structural Change in Agriculture and Gendered Division of Work

After the Second World War, dairy farming was strongly entrenched in Finnish agriculture because of an agricultural policy that favored small, single-family farms.⁵ The 1950s and 1960s were a period of intensive mechanization: tractors, combine harvesters and milking machines became more common. At the same time, the production of both grain and milk rose quickly due to efficient fertilizers, and better feeding of the animals. In the 1960s, there was already overproduction of grain, eggs, and butter, and this resulted in a U-turn in agricultural politics. Production was restricted by paying farmers compensation for leaving part of the fields fallow or reforesting them. Simultaneously, formerly self-sufficient small farms started to specialize in only one form of production, such as dairy farming. The number of small-scale farms decreased rapidly, and the size of the remaining farms started to grow. The percentage of people employed in agriculture decreased from 32 per cent in 1960 to little more than 9 per cent twenty years later (Rasila 504-06).

Along with the reforms and structural change in agriculture, the division of labor also started to transform. According to Siiskonen, the traditional division of labor prevailed on small family farms until the 1950s and 1960s, delineating milking as women's work. This started to change during the 1970s at the latest, when it became common that the couple owning the dairy farm worked together in the cowshed as equal partners. As the number of household members decreased, the farmer and the farmwife had to carry out all the work on the farm. Due to growing herd sizes, it was not possible for one person to conduct all the work in the cowshed. Therefore, the division of labor became a division between the persons, not necessarily between men and women ('The Role of Farmers' 92-95). However, still in the early 1980s, on small unmechanized farms owned by elderly couples, the farmwife typically took care of animal husbandry alone. Also, in peripheral areas in Eastern and Northern Finland the traditional division of work changed slowly (Siiskonen, 'The Role of Farmers' 95-96; Jarvenpa 82).

Milking Machines and Novel Agencies

In the responses to the ethnographic questionnaires, the most commonly mentioned reason for acquiring a milking machine was the lack of female hand milkers. As both Morell and Rasila have pointed out, this was related to the historical situation. After the Second World War, there was shortage of labor force, and industry was able to pay higher wages than agriculture. As employing people became more expensive, especially on large estates human labor was replaced by new technologies, such as milking machines (Morell 386-87; Rasila 504). On small farms, which were the majority in Finland, a more common reason for mechanizing milking was that the farmwife who had milked the cows by hand fell ill, or gave birth to a child, or became weaker due to old age, and therefore was not able to milk (see also Thorsen 142). In these situations, the shameful aspects of hand milking were mentioned in the materials. Some respondents stated that men simply did not milk by hand, or that 'manly honor' was at stake if men touched the 'tits' of the cow, and therefore they bought a milking machine. It was also claimed that hand milking was too difficult or strenuous for men, because they were not used to doing it. These accounts highlight the bodily relationship with cows formed in hand milking,

which was permitted for women but not for men (see Kaarlenkaski, 'Of Cows and Women' 22). In these cases, technology was needed to transform milking into appropriate work for men. However, there were some exceptions. Some men who milked by hand were also mentioned in the ethnographic materials, and many respondents stated that the farmer and the farmwife discussed and decided on the buying of the milking machine together.

Other reasons for buying a milking machine were also declared. For instance, cows themselves could contribute to the issue. When milk yield increased, it became too strenuous to milk by hand. Even some individual cows were brought up:

A milking machine was acquired in 1969. One heifer spurred the buying of the milking machine, because it was so hard to milk that I almost couldn't milk it by hand. It was a big relief when we learned to milk with a machine. (KM:K38/499)⁶

In these cases, the bodily processes of cows affected the arduousness of hand milking in terms of abundant milk secretion or stiffness, which resulted in taking control of their corporeality with the help of machines.⁷ Moreover, some respondents remarked also that the marketing and selling of milking machines was fairly aggressive, or that there was 'machine fever' in the neighborhood: several neighbors bought milking machines at the same time. In addition, an integral material prerequisite for the implementation of the milking machine was receiving electricity to the countryside. Electrification of the respondent's home village frequently coincided with acquiring a milking machine.⁸

Hand milking was arduous physical work that required practice and intimate physical contact with the cows. Before milking machines became common, hand milking was regarded as a skill that every countrywoman should master (Kaarlenkaski, 'Of Cows and Women' 16-17). On the other hand, the milking machine as technology was entangled with masculine meanings. The self-evident intertwining of men and technology occur frequently in the materials. As one respondent stated in an outright manner: 'Machine milking is more manly than hand milking, which has been regarded as women's work' (TYKL/kys/37: informant 183). Likewise, another one wrote that 'As a milking machine is a machine, it is understandable that men were interested [in it]' (KM:K38/654). It was also frequently noted simply that milking machines

brought men into the cowshed. A couple of respondents even stated that some men delayed buying a milking machine because they knew they would have to start to work in the cowshed when they had the machine. Thus, using the machine was represented as an inevitable 'destiny' for men. Related to this, it was also stated that at least at the beginning, women could not operate the milking machine appropriately, and therefore men were 'needed' in the cowshed. Unlike hand milking, using machines was represented as natural for men. As Saugeres (149-156) and Brandth (20-21) have shown, handling technology and machines may be regarded as an integral element in the identities of male farmers.

A large part of the research material repeats the unquestioned discourse of the masculinity of technology. However, there are some accounts in the materials that enable more detailed discussion of the relationships between technology and gendered agencies:

Nowadays family members and men work in the cowshed, even milk the cows. For machine milking is also easier for men to handle. (KM:K38/844)

Machines also made milking possible for those who did not have the skill or strength for hand milking, for example at our place men started to milk and at the same time the number of cows increased. (KM:K38/120)

Mechanization has brought about the fact that division of work is not so strict anymore, men are also able to put the laundry into the machine, or milk the cows, as well as women being able to work on the fields if they can drive a tractor. (KM/K38/825)

These citations suggest that milking machines, and some other machines, particularly replaced the physical, gendered work that in many cases included tacit knowledge. According to Polanyi, tacit knowledge refers to knowledge and skills that are acquired through practical experiences, and are often difficult to verbalize (4, 13-16). For example, hand milking was usually learned in practice, following the example of one's mother (see Thorsen 139-40; Kaarlenkaski, 'Of Cows and Women' 17). In the last citation, the respondent suggests that by using a tractor, women could also conduct work on the fields. Thus, gendered conceptualizations that were passed down from agrarian culture could be transgressed using novel technology. As Oudshoorn et al. have pointed out, artifacts, and the gendered meanings

that are inscribed in them, may shape the proficiencies, procedures, and duties of their users (472). Thus, it may be argued that the intermediary machine enabled men to touch the udder and the teats of the cow.

Machine milking with bucket milkers did not, however, eliminate physical contact with the cow. Udders still had to be washed, and in the early phases of milking machine use many conducted so-called ‘aftermilking’ by hand. Aftermilking was also recommended in a milking machine guidebook published in 1951, ‘at least as long as there is the slightest uncertainty in operating milking machines’ and if the herd had tendencies for udder diseases. It was feared that because both human milkers and the cows were inexperienced with milking machines at first, some milk would remain in the udders, and that would expose cows to mastitis (Palva 66).⁹ In relation to this, it was mentioned in several questionnaire responses that even though the farmer started to milk with a milking machine, the farmwife still wiped the udder clean first, and possibly conducted the aftermilking by hand. In addition, the milking machine was usually washed by the farmwife, and several respondents complained that washing was so time-consuming that the total time spent in milking did not diminish at all at first. Hence, the gendered division of work in cattle tending was not revoked immediately after a milking machine was put into operation, but there still were typically masculine and feminine tasks. Furthermore, the division of these gendered tasks was based on the traditional meanings related to corporeal human-cow relationships and reproductive work.

As described above, milking machines incited effects and action: men increasingly started to participate in milking work. Moreover, milking machines also introduced agricultural machinery to women. In Finnish milking machine advertisements published in the 1950s, it was typically represented as a machine that particularly women would use to ease their workload in the cowshed (Kaarlenkaski, ‘Lypsäjät, lehmät’ 57). Thus, the milking machine was not an exclusively masculine technology. According to the responses to the questionnaires, however, the farmer and the farmwife typically worked together in the cowshed after acquiring a milking machine. Although usually the purpose of mechanization is to reduce the number of workers (see Morell 399), in this case the result was the opposite: two people instead of one partook in milking. Nevertheless, in guidebooks the participation of men was regarded as positive, because

it would advance ‘the rationalization’ of animal husbandry generally (see Palva 98). This may be viewed as a continuation of the professionalization and masculinization of dairy farming, started in the late nineteenth century. As several researchers have shown, at the time the dairies became more effective and technologized, milk started to be pasteurized, and milk production in general started to be seen as serious work based on science, instead of being merely part of the household chores. At the same time, the feminine meanings related to dairy production were replaced by masculine connotations interlinked with technology (Block; Shortall; Sommestad; see also Kaarlenkaski, ‘Lypsäjät, lehmät’). According to Oudshoorn et al., technologies understood as masculine raise the status of the user, whereas technologies with feminine coding do not (474). It may be argued that the milking machine technology was ‘masculine enough’ to increase the status of cowshed work and made it attractive for men. As discussed above, the milking machine brought about negotiations and novel agencies in the gendered division of work in cattle husbandry.

Milking Machines and Cows

In the early stages of milking machine use, cattle tenders were concerned about whether the machine milked as carefully as a human being and if machine milking was detrimental to the health of cows.¹⁰ These worries were dissipated in machine milking guidebooks. For example, Palva stated in his manual that:

machine milking conducted appropriately may be perfectly paralleled with hand milking, even put before it. Putting a milking machine into operation – provided that the users of the machine are on the ball – is above all an economical question, which should be solved according to the conditions on each farm. (96)

According to the guidebooks, it was crucial to familiarize oneself thoroughly with both the technology of the milking machine and the physiology of the cow before starting to use the machine (Palva 10; *Konelypsyn opas* 3). For instance, both manuals discussed in this study include

detailed pictures on cow's udders and milk glands, and the preconditions of lactation were explained in the smallest detail:

Blood brings nutrients to milk follicles, where milk is formed in the cells located on the inner surface of the follicle. From these cells milk is pressed into the cavities of the follicles, where it stays until milking. Milk does not flow spontaneously out of the udder, but the effect of the milk secretion hormone, oxytocin, is needed.

(Konelypsyn opas 6)

The cow evidently has an active role in successful milking: she must 'let down' her milk, although this happens as a result of involuntary hormonal functions (see Palva 13-15).

Therefore, guidebooks recommended treating cows in a friendly manner and calmly while milking, and avoiding loud noise, bad treatment, and rough handling, as the latter could cause nervousness in the cows and make them 'hold back' their milk (Palva 16; *Konelypsyn opas 10*).

Thus, the biological body of the cow had to be taken into consideration as an agentive force, and, in fact, it was understood that the bovine mind and body worked together inseparably. It was also emphasized that milkers should be familiar with the individual traits of different cows, as these are significant in the success of milking. This skill required practice:

The milker should know the cows so well that he or she recognizes when they are ready for milking. This is of great importance regarding fast and careful milking. A cow is ready to be milked when her teats are heavy with milk. *(Konelypsyn opas 13)*

Although the human-cow relationships formed in animal husbandry are not equal but dominated by humans (see Porcher and Schmitt 57), it is necessary to take the characteristics and actions of the cows into account to make the work possible in the first place. While cows may be considered as mere objects of milk production if observed on the macro level (see Otomo 223), when analyzed on the micro level of cattle husbandry, their agency is irrefutable, at least in relatively small-scale production.

In the milking machine advertisements published in Finnish professional magazines in the 1950s, it was often emphasized that machine milking is 'natural' and pleasant for the cows. For example, one machine brand was mentioned to 'milk like a living calf'. In another

advertisement, a comic-style cow stated that ‘Mullerup [a Danish milking machine brand] milks just like we want’ (Kaarlenkaski, ‘Lypsäjät, lehmät’ 58). According to Nimmo, similar arguments have been featured in milking machine advertisements since the first pulsator models were launched. As he has pointed out, in the advertisements the agency of the cow was not denied but invoked and emphasized. The milking machine was represented as simulating the suckling of the calf more perfectly than hand milking (‘The Mechanical Calf’ 94-97).¹¹ Thus, it may be argued that the advertisers assumed that the experience and the point of view of the cow might interest potential buyers of the machine.

But how were the living bovine bodies and standardized machines merged in practice on the farms? Most people that touched upon this issue in their responses to the questionnaires stated that cows got accustomed to milking machines fairly quickly:

Cows liked the machine milking and it took a lot less time [to milk]. (KM:K38/463)

At first cows were afraid of the machines but very soon they got used to them. Milking work quickened and also cows seemed to be satisfied. (KM:K38/121)

This kind of short remark seems to support the image created in the milking machine advertisements: cows enjoy machine milking. However, some difficulties were also reported:

When we used the milking machine for the first time, Finncattle¹² got very nervous, milk was received only from a couple of them, in time eventually most of them agreed to machine milking. At first it felt like we had acquired an unnecessary machine, at first we didn’t save any time, on the contrary, it took more time. (KM:K38/747)

In 1967, on [Christmas] eve’s eve, we milked for the first time [with a machine]. The machine was sold and installed by an electricity contractor. [...] He also taught us to milk. The milkers were in a cold sweat and the cows were also nervous. When I managed to attach the first teat cups, they got hang of the thing and let me milk. Only fiery Juliska [a cow’s name] kicked the teat cups far to the manure gutter. She had to be milked by hand. We also bought a cattle clipper operating on the vacuum of the milking machine. When the cows were clipped, and also when Juliska got used to the hum of the machine, she let us milk her. (KM:K38/783)

Discussing the implementation of the milking machine from the point of view of the domestication of technology, it may be argued that cows also participated in this process. As described in the citation above, both cows and humans were in the same multispecies learning situation, which caused anxiety in both. According to Lie and Sørensen, the domestication process includes symbolic as well as practical dimensions. The symbolic meanings attached to particular technology are accepted or contested by individual users, and at the same time the artifact and its operation are assimilated into daily practices (10; see also Oudshoorn et al. 477). For cattle tenders, the symbolic meanings related to milking machines included, for instance, the gendered connotations related to technology and the work itself. However, it must be remembered that both humans and bovines had to adapt themselves to new material surroundings, routines, and bodily experiences.¹³ Nevertheless, although there were some problems in familiarizing cows with the milking machines, none of the informants reported that machine milking was impossible or totally useless because of cows.

If the agency of cows was interpreted merely as resistance, it would be minor or at least temporary in the accounts describing the introduction of the milking machine. However, animal agency as active assenting becomes visible here. As Despret has pointed out: ‘When everything happens as it should, we don’t see the work’ (42). When seen from this perspective, the brief mentions of cows getting used to machine milking quickly do not undermine the agency of cows but reveal the ‘invisible’ or ‘secret’ agency Despret refers to (44; see also Shaw 165). The invisible agency of cows materializes when everything goes smoothly: cows adjust to machine milking immediately and seem to be satisfied. This invisible work is actually the prerequisite of milk production. Certainly, the active participation of cows was also essential in hand milking, but it may be argued that the new technology foregrounded this agency (see Latour, *Reassembling the Social* 207-08).

Despite cows not strongly resisting machine milking, their bodies were recalcitrant, which was evidenced in increasing numbers of cases of mastitis reported in the responses to the questionnaires (see also Nimmo, ‘The Mechanical Calf’ 89, 97; Smith-Howard 124). In the guidebooks, unskilled machine milking was considered a risk for mastitis as well as udder injuries (Palva 99-104; *Konelypsyn opas* 4). In addition, according to Woods, focus on high milk

yields in breeding could produce overdeveloped udders that were more vulnerable to injury and defective milking machines (304). Hence, the efforts to rationalize dairy production by mechanization and increase the milk yield of individual cows resulted in contesting the limits of bovine bodies.

Conclusion

The introduction of milking machines is a particularly interesting object of study, because in Finland the device appeared in a situation in which two self-evident discourses prevailed: milking as women's work and technology as masculine territory (Kaarlenkaski, 'Lypsäjät, lehmät'). I have focused on Finland in this article, but as similar changes in the mechanization of dairy farming have occurred in other parts of Europe and Northern America, it may be supposed that my findings are applicable in a wider context as well. By discussing the implementation of the milking machine as a multispecies and relational process, I have aimed to challenge the understandings according to which mechanizing milking was a straightforward progression controlled by human beings. At the same time, I have foregrounded agencies that often remain invisible in animal husbandry. If dairy farming is understood as a network of relationships in which the parties enable each other's agencies, as Despret has suggested, these parties would include at least cows, milking machines and their manufacturers and marketers, cattle tenders, agricultural politics, material surroundings, as well as the gendered meanings of technology, and milking work. In this network of effects, both material and discursive practices constructed each other and the bodies of both human and bovine milking machine users.

For instance, the milking machine technology affected conceptions about bovine bodies and made milking work also possible for men. At the same time, it familiarized women with agricultural machines and made their work less strenuous. This had effects on the working practices of the whole farm. In Finland, however, women did not leave dairy production along with the mechanization, as has been reported in some other countries (see for example, Shortall; McMurry). Furthermore, the tacit knowledge related to hand milking that had been passed from one generation to the next, was increasingly replaced by physiological and technological

knowledge based on science. In addition, the bucket milker was, on many dairy farms, the first step in the mechanization of work: it was followed by bulk tanks, pipeline milking machines, mechanical manure removal, as well as automated feeding and milking systems.

In the course of their common history with human beings, cows have experienced many methods of milking. With the introduction of the milking machine, cows tangibly became part of industrial milk production. However, Nimmo has criticized perceiving the cow as totally objectified and controlled by the machine, and emphasized that the animal, machine, and human rather form a hybrid, ‘in which each constitutive element mediates and conditions the others, but not without persistent material frictions, stresses and moments of disjuncture, which at any moment could fracture the precarious assemblage’ (97). In order to avoid the fractures, milkers had to familiarize themselves with the features of both the milking machines and bovine bodies. Nevertheless, it is important to bear in mind that these hybrid relationships are not totally equal but, in the end, ruled by human beings. Milkers also had the power to decide on the lives and deaths of the cows.

As regards the milking machines and bovine bodies, they were in constant dialogue: although the milking machine was developed to imitate nature, the cows had to adapt to it as well. According to the responses sent to the questionnaires, cows adjusted to machine milking fairly easily. However, it may be argued that this does not reflect the passivity of the cows, but their active work, in which they participated in the domestication of the milking machine technology as much as humans. In addition, the biological body of the cow may be seen as an agent, whose involuntary processes affected milking: oxytocin that regulates lactation enabled milking in the first place. It is also crucial to pay attention to the unstableness of the human-animal-machine assemblage, as Nimmo suggests (97). For example, bovine bodies became overstrained and were exposed to mastitis due to unskilled machine milking and increased milk yields. In the complex interagencies of milk production, cows were central agents, and their agency included both assenting and resistance.

Notes

¹ For example, in Australia, in 1930, 25 to 50 per cent of dairy farms had a milking machine, whereas in England, the proportion of machine-milked herds rose from ten to 85 percent between 1944 and 1961. In the USA, the number of farms using milking machines increased especially rapidly between 1940 and 1954. (Henzell 138; Brassley, 'Output and Technical Change' 73; Gardner 14-15). In other Nordic countries (Sweden, Denmark, and Norway), milking machines were introduced in the 1940s and 1950s. For example, in Sweden in 1951, nearly 29 per cent of dairy farms had a milking machine, and half of the cows in the country were machine-milked (Morell 386; Brorsen et al. 34; Thorsen 142).

² The situation was similar in other Nordic countries, whereas in England, Ireland, and the USA, for example, men could also milk cows in the 19th century (see Thorsen; McMurry 251, 254; Shortall 249-51; Morell 383; Sommestad and McMurry 143). In Nordic vernacular thought, milking cows was considered disgraceful for men, and milk milked by a man could be regarded as unclean (Sommestad and McMurry 150-51; Östman 235). These feminine associations of milking may have resulted from the fact that women also lactate (Simonton 122; for the connection between women and cows, see also Adams; Gaard; Otomo). According to Sommestad and McMurry, the permanence of strict gendered division of work and feminine coding of milk was related to the importance of small-scale farming, a peripheral location, and cultural seclusion (151-52). For more on the background of the gendered division of work in animal husbandry, see Kaarlenkaski, 'Of Cows and Women' 14-15).

³ For a discussion of these issues in the Norwegian context, see Thorsen.

⁴ However, the subjectivity and agency of cows has been discussed in recent studies on automated milking systems (see for example, Holloway; Holloway and Bear; Driessen and Heutinck).

⁵ During the 1950s and 1960s, the typical Finnish family farm was a dairy farm with less than ten hectares of field and less than ten milking cows (Siiskonen, 'Maatila yrityksenä' 291). One

reason for the late introduction of milking machines in Finland was the small herd size. According to Brassley, in Britain it was assessed that the minimum profitable dairy herd size for using milking machine was twenty cows ('Electrifying Farms' 93).

⁶ All quotes from the research materials, originally in Finnish, have been translated by the author.

⁷ From the perspective of ecofeminist criticism, this situation reflects the use of patriarchal and technological power over women, animals, and nature (see Adams 33-35; Adams and Gruen 17).

⁸ The situation was similar in other countries as well (see Henzell 138-139; Gardner 14-15; Brassley, 'Electrifying Farms' 97, 99, 107; Flygare and Isacson 182).

⁹ In a guidebook published in 1967, aftermilking by hand was suggested merely if a cow had an abnormal udder structure. In addition, it was also advised that aftermilking should be conducted using the milking machine, massaging the udder by hand at the same time (*Konelypsyn opas* 23). When the vacuum pumps of the machines were developed to be more efficient, aftermilking by hand became unnecessary (Flygare and Isacson 185). For more on the relationships between machine milking and mastitis, see Woods.

¹⁰ On similar apprehension in Britain, see Holloway and Bear 219-22.

¹¹ Interestingly, Morell does not discuss this argument in his article on Swedish milking machine advertisements, although it is visible in some of his examples (413).

¹² Finnish native cattle breed.

¹³ For example, while earlier it was customary to milk the cows by hand on the meadows in the summer, the milking machine forced the cows to be brought into the cowshed for milking (see KM:K38/616).

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