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Living Machines with Gentle Looks: Materiality and Animal Body in Modernizing Finnish Animal Husbandry

Introduction. The aim of this paper is to investigate the modernization of cattle-tending in late nineteenth-century and early twentieth-century Finland from the viewpoints of materiality and embodiment. My primary questions are: how were bovine bodies, embodiment, and agency represented and conceptualized? What qualities did “good cows” have at the time? And what are the material implications of these conceptualizations for the bovine and human bodies on farms? Although the modernization of dairy production has been explored from the point of view of animal studies in some inquiries (see, e.g., Nimmo, *Milk, Modernity* and “Bovine Mobilities”; Orland; Gjerløff), the discourses and practices regarding the actual handling of the animals and conceptualizations about their embodiment and agency deserve more attention. As historian Erica Fudge has pointed out, it is difficult to piece together the lives of animals in the past, and usually one must employ many types of materials, even fragments and scraps (“Farmyard Choreographies” 162). In order to do this and to gain a multidimensional view of human-animal relationships, the materials studied in this paper represent different perspectives: views of cattle tenders will be explored through answers sent to an ethnographic questionnaire, and the perceptions of advisors in the field will be examined by looking at contemporary guidebooks on animal husbandry.

The wider context of the study relates to the rationalization process of agriculture in Europe which had begun during the early modern period, when livestock farming started to expand. The “agricultural revolution” in the eighteenth century made it possible to keep bigger herds of animals, and farm animals were increasingly seen as commodities. These changes were related to a new scientific worldview, which emphasized the division between human beings and non-human animals (Raber, “From sheep” 78-85; Ritvo 3). However, the modernization process was not straightforward and simultaneous in the whole of Europe. As Brantz has pointed out, during the nineteenth century, agriculture was in many areas still based on small-scale, self-sufficient family farms rather than mass production (82-83). Although there are differences in the periodization of the modern era, it may be argued that around the mid-nineteenth century, the humanist discourse, dating back to antiquity, was restructured and realized in new ways materially, transforming different practices and

institutions as well as scientific and technological understandings. This meant that nature and animals were increasingly taken into possession by technology and industry (Nimmo, *Milk, Modernity* 2-4; Rundell 8-11).

The present study focuses on Finland, where the modernization of agriculture and livestock farming did not begin until the second half of the nineteenth century. As historians Seppo Simonen and Viljo Rasila have summarized, farming was modernized at the time by shifting production away from grain growing and towards milk production, since the former had become unprofitable due to foreign imports and years of crop failure throughout the 1860s. Dairy production thus became an important source of income for Finnish farmers, unlike earlier, when cattle had been kept primarily for producing manure for grain fields, and milk was produced mainly for household consumption. In addition, the state¹ began to support animal husbandry by establishing advisor organizations to counsel farmers on producing butter and cheese, dairy and milkmaid sections were introduced in agricultural schools, and loans were granted to establish dairies. Information on better farming methods was distributed by the press and new farming societies, and guidebooks were published (Simonen 89-90; Rasila 497-99). The shift in production methods was linked to wider societal and cultural changes: the second half of the nineteenth century was a period of modernization, industrialization, and national awakening in Finland. The change from traditional self-sufficient farming towards commercial dairy production constitutes an interesting background for the study of human-cattle relationships. As similar transformations took place in many other European countries and North America at approximately the same time (see, e.g., Israelsson 59-65; Bourke; Hansen; Shortall; Orland), the findings of the present study may also be considered interesting from an international perspective.

As historian Erica Fudge has pointed out, agricultural history has usually tended to handle animals as part of farming practices or patterns of consumption. Animals have often been discussed numerically, for example in terms of herd sizes, weights, and numbers slaughtered. What she suggests is “an animal history of agriculture,” which concentrates on the impact of the animals on the environments and cultures, as well as emotional and economical human-animal relationships. Instead of providing a stagnant image based on statistics, Fudge proposes focusing on the collaborative movements of humans and animals that are essentially formed in animal husbandry (“What was it like” 4; “Farmyard choreographies” 147). Following Fudge’s ideas, this article aims to

bring out and analyze descriptions of animal embodiment and material human-cattle relationships at the grassroots level of animal husbandry. This will be done by applying a theoretical framework combining new materialist thought and theories of animal agency, which will be elaborated upon in the next section. After setting the theoretical stage, research materials and methodological approaches will be presented in detail. The empirical analysis will begin by discussing the general attitudes towards modernization of animal husbandry presented in the materials. Subsequently, three themes highlighting the embodied and material perceptions of cattle will be analyzed: education about animal anatomy, conceptions of mechanical and sentient features of cattle, and the characteristics of good milking cows. In the concluding section, the most significant theoretical and empirical findings of the study will be summarized.

New Materialism, Animal Bodies, and Agency. The theoretical framework of the study is inspired by new materialist thought, which emphasizes that embodied humans are essentially part of the material world (Coole and Frost 8). I understand both human and non-human bodies as material-discursive phenomena constituted in the entanglement of material and cultural practices, which are inextricable (see Grosz x-xi; Eitler 265-68). According to Manuela Rossini (16), human and non-human bodies are in constant interaction with each other and their environment, and they construct each other through relationships and dynamic impacts. Hence, cattle are seen in this study as companion species, following the concept formed by Donna Haraway (11-12, 15-16), because they have lived in interaction with humans for millennia and participated in constructing the mutual relationships of the two species. It has been necessary for humans and cattle to learn to operate in shared environments, and also to interpret each other's communication (Kaarlenkaski, "Kertomuksia lehmästä" 237-41).

As Karen Raber has pointed out, however, animal embodiment has not been extensively explored, especially not in historical accounts of human-animal relationships (*Animal Bodies* 12, 18). The ideas of Pascal Eitler provide interesting starting points for the study of animal embodiment. He has suggested "placing the body and its ongoing materialization" (273) at the center of animal history, and emphasized the social aspects of human-animal relations. Following Eitler, I will focus on the societal requirements that fall on different bodies in human-animal relationships (266). In the context of this paper, this means concentrating on the demands posited by the modernization and rationalization of animal husbandry.

It is also important to note that when studying farm animals the animal bodies in question are both *living bodies* and *dead bodies*. Cattle keepers work and interact with

living animals, but the work is governed by awareness of the fact that, in the end, the animal will be slaughtered and used for food. Therefore, the idea of the dead body is often present in the practices with living bodies (see Wilkie 147-56). Relating to this, Erica Fudge has emphasized the inseparability of living animal and animal matter. She has developed a concept of “animal-made-object” which refers to two concurrent meanings: “(1) the *animal-made* object — the object constructed from an animal, and (2) the animal *made-object* — the objectified animal” (emphasis original). The concept highlights the position of animals as both agents and matter, as well as the contradictory nature of human-animal relationships. In addition, Fudge has suggested that (dead) animal matter may also be seen as active (“Renaissance” 42).

Thus, in this paper, agency, intentionality, and subjectivity are not seen as exclusively human qualities: agency is understood as relational and also includes non-human actors (Coole and Frost 8-10, 20-21). According to philosopher of science Vinciane Despret, agency is formed in relationships and it manifests itself in capabilities to incite and inspire other beings to act and be activated. She suggests that agency emerges in “a flow of forces” comprised of multidirectional relations of effects. This means that the parties are interlinked and they enable each other to become agents in their mutual relationships, interagencies (38-41, 44). Furthermore, as Chris Pearson has pointed out, animal agency comes in many forms. Depending on the animal species and living conditions, animals may affect their environment, for example, by allowing or restraining historical processes or by “acting with a degree of intentionality” (15). According to Gary David Shaw, agency may be seen as a continuum of actions, on which both human and non-human beings move (165).

Both Despret and Pearson have criticized the view, shared by some researchers (e.g., Philo and Wilbert; Hribal), that animal agency becomes visible primarily when animals resist what humans want them to do or what is done to them. According to Pearson, reducing animal agency to resistance creates unnecessary oppositions between humans and animals, and may dismiss situations in which animals maintain human pursuits (14). Despret, on the other hand, has pointed out that the agency of animals often remains invisible in situations in which animals do what is expected of them. She suggests, however, that this also requires active investment and consent from the animals. In many cases, animals appear to be “secret agents,” whose actions and relational impacts need to be excavated from historical accounts (42-44; see also Shaw

165). In this paper, this is done by reading published educational literature and archived manuscripts.

Reading the Animal in Old Written Materials. The materials for this study were produced between the 1860s and 1930s, a time frame that encompasses crucial changes in the modernization of animal husbandry in Finland. One important channel of distributing information on new practices were cattle tending guidebooks.² The research material includes ten books concentrating on cattle husbandry, published between 1865 and 1923. These were either textbooks for agricultural schools or books directed at small-scale farmers to improve their procedural practices in animal husbandry. The selected books concentrate on concrete and practical issues of cattle husbandry. Four of the books in the selection were translations or adaptations from Swedish or Danish. According to Toivio, Denmark was regarded as a model for Finnish agriculture at the time, and many central Finnish farming developers studied there (108-09). The authors or translators of the guidebooks were agronomists and/or teachers of agricultural schools. Thus, they were distinguished authorities of the field. The guidebooks implicate how “the folk” and animal husbandry were represented, and in which direction they were expected to change. In addition, views on cattle and human-cattle relationships may also be read in the books.

In addition to guidebooks, I will analyze ethnographic descriptions written in response to an ethnographic questionnaire, first published in 1893 and re-published in 1910 and 1930. As described by Haltsonen, the questionnaire was compiled by a scholarly society called Muurahaiset (Ants), established by ethnologist Theodor Schvindt in 1886. One aim of the society was to collect material for an ethnographic dictionary, and to do that it published questionnaires on different areas of rural life and livelihood, including cattle tending. Later, Muurahaiset was organized as a branch of the Finnish Literature Society, which was already at the time an established cultural organization and archive. However, the ethnographic dictionary was never published (Haltsonen 232-38, 349). The purpose of the questionnaire is inevitably seen in the formulation of the questions. The list of questions about cattle tending takes up two pages in the booklet and includes questions such as “How were cattle named in different ages and different situations? [...] What kind of food and drink was given to different types of cattle in different situations? [...] What names were given to cows and oxen?” (*Suomalaisen Kirjallisuuden Seuran* 37-38).

People who responded to the questionnaire were laypersons interested in collecting folklore and ethnographic information. Most of them were rural officials, but there were

also some farm owners among them.³ The formulation of the questions had a clear effect on the descriptions, as it was usual during those times for the respondents to comply strictly with the questions of the questionnaire. As Pia Olsson has pointed out, informants were not expected to represent themselves, but instead a particular district and its culture, reporting what was common in their communities (40). Thus, the responses describe cattle tending on a rather general level; personal opinions or experiences are almost absent in the texts. I have read altogether 68 ethnographic descriptions of cattle tending, written by 61 different respondents.⁴ More than half of the respondents were men (34) and 11 of them were women; 16 writers reported only the initial letters of their names, but these were probably also men. The descriptions were sent from different parts of Finland, excluding Lapland. Nearly half of the descriptions were written in the 1890s or earlier.

It is evident that the materials used were not originally produced to describe human-cattle relationships or perceptions of bovine embodiment, which presents a methodological challenge for the study. Therefore, the questions that I have posed concerning the ethnographic material, for example, differ significantly from the original queries of the questionnaire (see also Olsson 12-13, 20). The first task was to actively “read the animal” in the materials, a method which may be paralleled with reading “against the grain.” Lakomäki, Latvala, and Lauren have described reading against the grain as a critical investigation of texts, aiming to find and highlight meanings that are not in the forefront in the writings, meanings that the writers have possibly not even intended to include in them (12). Applying this method, I attempted to find in both guidebooks and ethnographic materials descriptions of human-cattle relations and their material dimensions, and collected those sections of the texts. Due to the nature of the materials, these issues were not usually in the foreground in the texts, and locating them required close reading.⁵ Subsequently, I organized the sections thematically and focused especially on animal embodiment and agency, gathering and analyzing the most interesting formulations in relation to the questions of the present study.

However, it is important to bear in mind what Fudge has written about the dangers of anachronism in using theoretical concepts: “all models of animal agency must be understood as historically specific and contingent: we must keep the historical worldviews we encounter to the fore in our analyses” (“What was it like” 8). Therefore, my findings are brought into their context by exploring contemporary ideas about animals and cattle tending. In addition, I will follow the methodological guidelines of

new materialism and analyze discourses as intertwined with material practices, i.e., I will pay attention to the material effects of the discourses found in the texts (see Eitler 267).

Towards Commercial Dairy Farming: Education, Enthusiasm, and Resistance. As mentioned above, in the nineteenth century animal husbandry was usually merely one sector in the small-scale, self-sufficient production of Finnish farms. According to Simonen, milk production of cows was very low due to poor feeding and harsh living conditions (9).⁶ Moreover, as several researchers have argued, cattle tending was regarded as part of food management of the household carried out by women, not a separate field of work (e.g., Siiskonen 94; Simonton 122-23).⁷ In such a situation, it was understandable that the central aim of cattle tending guidebooks was to rationalize animal husbandry, and to replace traditional vernacular practices with more reasonable and profitable procedures. This attitude is seen especially in the oldest books in my sample, in which “the folk” are directly described as ignorant, backward, and lazy.

In general, the guidebooks gave advice on the very basics: proper feeding and suitable conditions in the cowshed, as well as breeding and recognizing good milking cows. One aspect which was especially emphasized was orderliness: all work in the cowshed was supposed to be done regularly and systematically. In addition, special attention was paid to improving hygiene. As Hustak has shown, during the modernization process of milk production, the sanitary reform concerned both bovine and human bodies, and the cleanliness of cows and their caretakers was seen as intertwined (200-09; see also Block). Many improvements suggested in the guidebooks included material aspects, such as changing the structure and furnishing of the cowshed, which transformed the environment of both cattle and their caretakers. At the same time, some enhancements may be seen as primarily cultural, as, for example, conceptions about good milking cows, and novel understandings of cleanliness. Nevertheless, these were also strongly linked with and thereby affected material surroundings, and bovine as well as human bodies. According to Heinonen, who has studied education on household management, similar themes were common in advisory publications in general at the time; they warned against laziness, uncleanness, and wastefulness. Integrity, patience, friendliness, diligence, and self-control were seen as ideal characteristics (137-47). Thus, cattle tending guidebooks may be seen as an integral part of contemporary popular education (see also Israelsson 74).

An important material and technological precondition for the modernization and expansion of dairy farming was the invention of the separator in 1878.⁸ It enabled the

separation of cream from milk efficiently, and as early as the 1880s it was a common device in Finnish dairies. In the 1890s, smaller home separators started to proliferate, improving the quality of home-made butter (Peltonen, "Uudet kaupallistumisen" 99-106; see also Hansen 233; Bourke 160-61). As Simonen has pointed out, the attitudes of the farmers towards the changing line of production varied. On the one hand, the introduction of the separator caused feverish enthusiasm in some, described colloquially as "milk fever" or "dairy daze," but on the other hand, some farmers have been described as reluctant to give up the customary tradition of grain growing (104-05, 120-21).

The suspicious attitudes towards commercial dairy production are also seen in the ethnographic descriptions, in which it is mentioned that skim milk produced in dairies was made fun of, and even "mock songs" about dairies were written. According to an informant, people feared that skim milk would be unhealthy, or at least it did not taste good and was not nutritious enough (SKS KRA. Kallio, K.E. E 122. 1935. Kokemäki, South-West Finland;⁹ on similar apprehension in the USA, see Smith-Howard 75-77). In addition, one respondent wrote that because of the "dairy daze" people had started to regard cows as gods and the best feedstuff on the farms had to be given to them. This left horses almost without nutrition and care (SKS KRA. Ruusunen, Nikolaus E 48. 1904. Several municipalities in Southwest Finland). This probably hyperbolic statement was related to the fact that traditionally horses were given the best fodder, because they were seen as being more valuable than cows. Horses were also used for enriching one's public appearance and marking social status, rather than merely for working. In addition, they belonged to the male public sphere, whereas cows were a part of women's domestic world (Frykman and Löfgren 181-82). The rising status of cows could cause confusion among farmers.

Moreover, increasing field cultivation was necessary to produce sufficient amounts of high-quality hay for the cattle. Earlier, the hay for winter feeding was gathered from meadows and marshes (Simonen 89). In many cases, small-scale farmers regarded field cultivation of hay with suspicion (Koivisto 10). Thus, the production methods of cattle fodder were linked with profound cultural and practical changes in agriculture. As Kokko has put it, traditional slash-burning, practiced especially in Eastern Finland, was based on oral tradition and practices delivered from one generation to the next, whereas field cultivation was linked to the spreading of literary knowledge (151). Farmers were not used to acquiring information from books, but instead relied on the local knowledge

learned as part of the work (Luukkanen 268). According to Richie Nimmo, who has studied the modernization of the British dairy industry, the discourse of modernization entailed tensions between the practical, traditional knowledge of the farmers and the rational scientific knowledge represented by the contributors to commercial dairy production. In many cases, farmers questioned the new methods and pieces of advice until they were proven to work in practice (*Milk, Modernity* 128, 133, 136).

On the other hand, many respondents to the questionnaire were content with the improvements of animal husbandry and despised old customs and beliefs. According to Mikkola, the modernization of farming was resisted by some and accepted enthusiastically by others, as was also the case with other new innovations (“*Odotettavissa uhkaava*” 5; *Tulevaisuutta vastaan* 149-53).¹⁰ As one respondent to the questionnaire stated, cattle tending was first improved on bigger and more developed farms. These were influenced by agricultural exhibitions, ambulatory milkmaids hired by the cattle breeding and control societies, as well as milkmaid education, and literature (SKS KRA Ekman, E.A. [Tunkelo]. E 45. 1894? Längelmäki, Pirkanmaa). From these progressive farms, the new information was also spread to their environment (Mikkola, *Tulevaisuutta vastaan* 148).

Familiarization with Animal Anatomy. The anatomy of the animals was one of the central themes of the guidebooks. For example, Grotenfelt pointed out in his book, published in 1892, that it is absolutely necessary to know the different body parts and their functions in order to organize cattle tending and feeding properly (5). Some guidebooks included basic information on bloodstream, breathing, and skin, but special attention was paid to the bovine digestive apparatus, probably because it differs significantly from the human one, and also from many other domesticated animals such as horses and swine. In addition to explaining the functioning of the digestive tract and rumination, the four-compartment stomach was demonstrated by a drawing in a few books. It may be argued that these pictures continue the tradition of medical compendiums featuring detailed images of animal anatomies, the earliest of which were published in the sixteenth century (see Raber, *Animal Bodies* 46-47).

As Nimmo has pointed out, this interest in the “inside” of the animal body reflects the scientific approach to animals that started to prevail in the late nineteenth century. With the help of microscopes and other equipment, earlier invisible “truths” about the natural processes of animal bodies were revealed, and this required specialist knowledge (*Milk, Modernity* 87-88). Developing results of biology and other life sciences are also visible in the guidebooks: in the latest book in my selection, published in 1923,

the composition of the animal body is explained on the level of chemical elements instead of organs. In addition, the functioning of cells and metabolism are explicated (Nylander, Cajander, and Poijärvi 135-38). Thus, the vernacular practical and “superficial” knowledge about animal bodies was supplemented and even replaced by more “deep” expert knowledge.

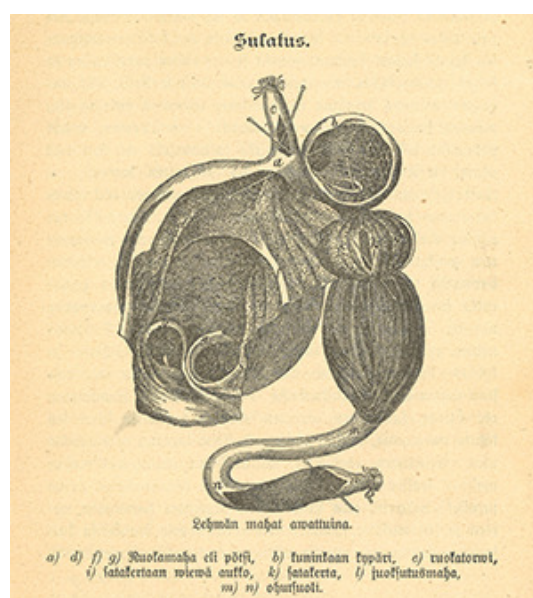


Figure 1. Nylander, *Ohjeita karjataloudessa pienviljelijöille (OKP) II 5.* “Stomachs of the cow opened.”

Contemporary anatomical facts were often used as grounds for the treatment of cattle in the guidebooks. For example, in a book dating back to 1865, it was recommended that cattle be given a sufficient amount of rough-grained feedstuff to keep them ruminating, as this is natural for them, and they should have enough resting time to ruminate properly (Sakari Sakarinpoika 14). Those items of advice were necessary because according to the ethnographic descriptions it was common at the time to feed cattle in the winter with straw and mash that included, for example, vegetables, chopped hay, or straw, and some flour mixed with warm water. This kind of fodder does not need ruminating, and therefore Sakari Sakarinpoika advised giving mash only in small amounts at a time. Furthermore, in some parts of Finland, oxen were still used for working in the fields, and the author was concerned about their capability to rest and ruminate (*ibid.*). In later books, such as Nylander’s manual published in 1907, it was

explained that bovine bodies need different nutrients: protein, fat, “sugar-like substances,” minerals, water, and a little salt. Accordingly, the nutritional values of different feedstuffs were described, and instructions were given on the correct proportions of different fodder (*OKP II* 6-12; see also Grotenfelt 11-13; Hallenborg 10-15).

The purpose of detailed advice on feeding was, obviously, to increase production. The guidebooks reminded readers that the feedstuff given to an animal is used first for living, and secondly for production. For example, both Grotenfelt (13) and Lindqvist (13) brought up in their manuals that during scarce feeding the animal stays alive, but there is no surplus for production. The economic significance of milk was growing during the time frame investigated here, and it is presented as the most important product received from cattle in the guidebooks. Probably for that reason the anatomy of the organs producing milk was also presented in detail in several guidebooks. The function of milk glands and their connection to bloodstream was explained. For example, Grotenfelt stated in 1892 that “Milk is formed from the carnation red blood that circulates in the arteries” (1).¹¹ As Nimmo has put it, milk “is an irreducibly vital substance, bound up inexorably with the bodily processes of a specific form of life, a living animal, and is emergent from complex interspecies relations” (“Bovine Mobilities” 57, emphasis original). To continue Nimmo’s idea, milk could not be produced without the bodily investment of both cows and their caretakers and milkers. Hand milking practiced at the time may be seen as interagency, which required mutual adjustment to each other’s movements and different body shapes (see also Israelsson 142-44; Kaarlenkaski, “Kertomuksia lehmästä” 216-19; “Of Cows and Women” 16). Both milking and handling the milk were strenuous manual work, shaping the almost invariably female human bodies that conducted the work.

To use Erica Fudge’s concepts, milk is an animal-made-object, in the meaning of “object constructed from an animal.” As both Nimmo and Fudge have suggested, animal-made-objects encompass the animal presence, often recalcitrant to objectification. This was especially the case with milk that is extremely perishable and a potential seedbed for bacteria (Fudge, “Renaissance” 49-50; Nimmo, “Bovine Mobilities” 66-69). Nevertheless, at the same time the dairy industry increasingly transformed cows into “objectified animals,” as their level of milk production was economically valued, and, consequently, their bodily functions were explored and controlled.

In the discussion above, the bovine bodies concerned are living bodies with their active vital functions. However, dead bodies are also present in the guidebooks. According to

Peltonen, milk was the leading article of Finnish farms, but beef and veal were also sold as much as possible to earn cash income (“The Iron Cage” 238-39). This was also noticed in the guidebooks, and advice was given on how to effectively fatten up animals (e.g., Lindqvist 75-79; Hallenborg 40-42; Cajander 52-53). In Lindqvist’s book, published in 1886, the bovine anatomy was illustrated from the point of view of the value of the meat (80-81). The picture is an explicit example of an objectified animal: the bull is reduced to pieces of meat. However, the areas of different types of meat are drawn on an apparently live animal, not a carcass. Regardless of the objectification, the animal maintains its potential for active agency (see also Raber, *Animal Bodies* 50). An animate bull and a variety of beef are present in the illustration at the same time. The picture tangibly demonstrates Fudge’s idea about the inseparability of a living animal and animal matter (“Renaissance” 42).

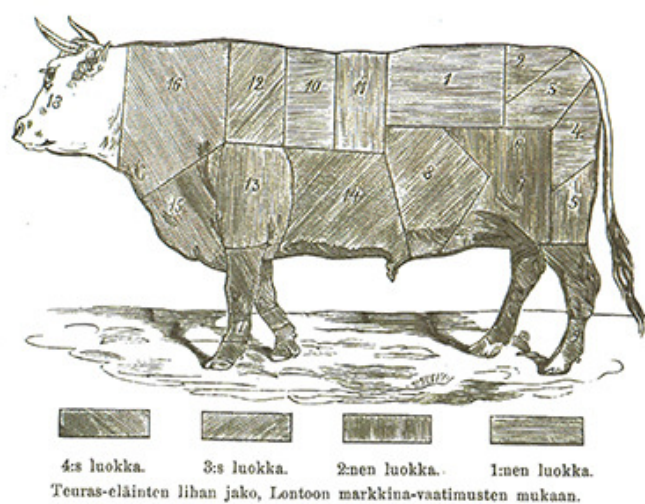


Figure 2. Lindqvist 81. “Meat classification of the slaughter animals according to the requirements of the London market.”

“Living Machines” Treated with Care and Love. As the status of dairy farming was not yet established during the investigated time frame, many guidebooks set out to increase the appreciation of animal husbandry and emphasized its significance as a livelihood. At the same time, they described the position and function of cattle. For example, in 1877, Oljelund formulated the importance of cattle husbandry as follows:

The most profitable [livelihood] nowadays and in the future in our country will be transforming food substances quickly into milk. But this may happen only by keeping dairy cows. For even during years of crop failure, even a smallholder is able to buy the cattle feed he needs, because he has constant income from his cattle, and he may transform the fodder given to the cattle into milk. (21-22)

Although the excerpt highlights the significance of dairy cows, they are described as material resources that are able to transform fodder, unsuitable for human nutrition, into milk that could be sold (see also Nimmo, *Milk, Modernity* 137). In Lindqvist's guidebook, this was seen as a natural function of cattle: "As bovine animals are also able to digest rough-grained foodstuff, they have been created to eat them and acquire benefit from them for human beings" (49). In addition, it was mentioned in some manuals that cattle compensate human beings for the care they provide them with their products (Sunila 3; Grotenfelt 14; for similar perceptions, see also Fudge, "The Animal Face" 187). In some guidebooks cattle were referred to as machine-like, such as in the following description from Hallenborg, published in 1904:

The position of animal husbandry in farming is always understood in the right way when animals are seen as *living machines* belonging to farming, who utilize all the products that cannot be sold in their natural form. In that case, the cowshed is a factory, into which a farmer acquires those fodder substances that are the cheapest for producing meat, milk, etc. It has not been long since keeping dairy cows was commonly seen as "a necessary evil." However, now the state of affairs is different. Based on practice, it is known that milk production is the best source of income for a farmer. (10, emphasis original)

Similarly, in Lindqvist's manual body parts of the animals were called "machines of the body" (2). According to Orland (169) and McMurry (23), similar discourse was used in agricultural journals and manuals in Central Europe and the USA. Understanding cattle as machine-like was part of the modernization process and progressiveness of the time. As Heinonen has shown, similar machine analogies were used in different fields of educational literature (138). Mechanistic ideas about non-human animals as well as humans originate from seventeenth-century Cartesian philosophy. According to Descartes, both humans and animals were automatic machines, but there was a profound difference: humans had minds and souls within the machines, whereas animals did not (see, e.g., Fudge, "The Animal Face" 182; Raber, "From sheep" 84-85).

According to McShane and Tarr, during the nineteenth-century industrial revolution it was common to view domesticated animals as machines whose performances were calculated and valued economically (2-7). As may be seen in the quotation from Hallenborg's guidebook above, the cowshed was transforming from a nest of "necessary evil" into a modern factory, in which "cheap fodder substances" were acquired in order to gain "the best source of income." However, in this context machine and factory analogies should not necessarily be interpreted as negative. For example, the demands for cleaner and increasing milk production improved the hygiene and feeding of the cows (see Israelsson 74-75).

Despite the fact that bovine bodies were described as machine-like, guidebooks invariably underlined good treatment of cattle. Although cows were described as "mindless creatures" in the oldest book in my sample, dating from 1865, the author emphasized that cows are able to recognize their caring keeper and are tame and compliant with people that caress them (Sakari Sakarinpoika 24). In addition, Oljelund recommended "gentle care" (22), and Grotenfelt even suggested treatment "with love" (14) in their books. According to Sunila, whose manual was published in 1898,

A cow must be always, and especially while milking, be treated kindly and friendly, because otherwise it "holds back" its milk, gets restless and easily adopts the bad habit of kicking while being milked. (18)

Thus, kind treatment was used to prevent unwanted behavior. Nylander saw this kind of handling of the animals as profitable for human beings in a more general sense:

Bad treatment of animals always expresses brutality and barbarism and bad relations between caretaker and animals. If the caretaker likes his/her animal and the animals like their caretaker, shouting, anger, kicking or hitting never come into question. Without the right kind of good relationship with animals, we cannot expect good production from them. An animal treated badly gets timid or angry. Timidity and anger generate dysfunction in the nervous system. Bodily metabolism depends on the nervous system, that is, it also effects digestion of the fodder and milking. Even mere humanity obliges us to treat animals well, but also our own benefit demands that. (*OKP II 41*)

Here, good treatment of animals is linked to the standard of civilization. As several researchers have shown, early animal protection movements also emphasized the connection between animal cruelty and impulsive and violent behavior between human beings. Also in other parts of Europe, advice on kind treatment of animals was especially directed to lower classes, who were seen as indifferent to the suffering of animals. Instead, the ideology of the time represented the bourgeoisie as endorsing humane values (Brantz 75; Kete 1-4; see also Kokko 143; Nieminen 10). It may be argued, however, that kind treatment of animals was not unfamiliar to contemporary cattle tenders. In the ethnographic descriptions, it is mentioned that the cows were talked to and patted while milking, and some women even sang to the cows while they milked them. As one respondent stated regarding milking: “harshness did not help, but kindness did” (SKS KRA. Eero Väkiparta E 45. 1907. Räisälä, Karelian Isthmus). Nevertheless, it must be remembered that views of good care have changed over time, and nineteenth-century vernacular practices of slaughter, for example, were cruel from the present-day perspective (see Nieminen 56-57; Kaarlenkaski, “Cattle Tending”).

To return to the quotation by Nylander above, economic profit is also invoked in it, as the production of cruelly treated animals decreases. This argument may be linked to the idea of stewardship, which has been described as an essential ideology in farming. According to this philosophy, nature and animals are for human use, and a farmer’s task is to make them as productive as possible. For example, animals should be treated well, but not because they have intrinsic value, but because of human welfare and benefit (Thompson 72-76, 86). These thoughts are compatible with the ideals of rationality and intensification, which are fundamental themes in the guidebooks. In addition, it is suggested in the ethnographic descriptions that economic factors urged the farmers to improve, for example, hygiene in milk production, as unclean milk was sent back to them from the dairies (SKS KRA. Ruusunen, Nikolaus E 48. 1903. Several municipalities in Southwestern Finland).

In the quote from Nylander’s manual above, it is especially interesting that the emotional states of the animals are linked to the nervous system and, consequently, to the physiology of digestion and milk production. As Block has shown, there was also similar discussion concerning the connection between a cow’s nervous system and milk secretion in the USA during the late nineteenth century and early twentieth century. It was believed that the treatment of cows, and also the characteristics of particular animals, affected milk quality significantly (118-19). In the same way, in Finnish guidebooks, the “living machines” are described as sentient beings, whose mind and body work together inseparably. These “machines” do not work automatically, but they

need to be treated gently in order to collaborate with them successfully. Although the profits of good treatment were known earlier, now they could be validated by scientific theories of physiology.

It may be argued that the descriptions of proper treatment of cattle in order to keep them compliant expose the possible resistance of the animals. Furthermore, in the ethnographic descriptions, it is mentioned that kicking while milking might be prevented not only by kind treatment, but by force: putting a fur coat on the cow's head, binding its hind legs together or squeezing its nostrils. As the respondent reporting such actions stated: "There is nothing to tell about good and calm cows" (SKS KRA. Laurila, Lauri E 138. 1937. Kannonkoski, Central Finland). This brings to mind Despret's idea about the invisibility of the desired behavior of animals: "When everything happens as it should, we don't see the work" (42). And there is nothing to tell about it.

The depictions of thwart or means for rejecting animal resistance direct attention to "negative" agency of the animals, but some clues referring to "positive" agency may also be found in the ethnographic descriptions. For example, in many cases the cows were expected to return independently from the forest pastures to get milked, because shepherds were not always used.¹² Reciprocally, in the evening, when cows came home from the forest, the farmwife went to meet them, and gave them a little food from her hand. Thus, it was anticipated that cows would learn the practices of this particular human-animal relationship and act accordingly. These agencies formed in the multispecies relations were often coordinated by tacit knowledge that is rarely articulated and maybe even impossible to write down (see Fudge, "Farmyard Choreographies" 156). This "secret agency," the active consent of cattle to operate in collaboration with humans, is actually the prerequisite of animal husbandry.

Characteristics of a Good Cow. Although new ideas and methods of cattle tending were distributed, traditional customs, beliefs, and magic rites still persisted in many areas of cattle tending at the turn of the twentieth century (Kaarlenkaski, "Cattle Tending"). For example, in vernacular thought depicted in the ethnographic descriptions the conceptions of good milking cows were somewhat different from present-day ideas. Abundant milk production was not the only desirable quality of the cow; equally important was that it did not eat too much, was easy to milk, and came home easily from the pastures in the forest. Concerning the milk production, cows that

“dried off” late or even continued to lactate until their next time giving birth were considered good. This conception was refuted in the cattle tending guidebooks, and it was emphasized that cows need time to rest from milking before their next lactation. Hence, in vernacular thought, the ideal bovine body was tenacious and undemanding.

At the time, most of the farms were very small and did not have resources to keep many animals. Therefore, it was not possible to keep all the calves alive that were born. Usually, the calves of good milking cows were chosen to be raised. Interestingly, traditional beliefs also suggested that the appearance of the animal had to be taken into account (see also Nimmo *Milk, Modernity* 141-42). For example, a big and strong-looking body, a long tail, big ears, small head, “beautiful eyes,” and the color of the muzzle were mentioned as signs that were believed to predict that the calf would be a good cow. Different colors of the fur were favored on different farms. It was also a good sign if the calf seemed to be perky and lively and ate eagerly. These conceptions were based on traditional local knowledge and practical experience (see Orland 178; Nimmo, *Milk, Modernity* 141). Due to geographical restrictions, it was usually not possible to choose between different bulls for breeding: usually the nearest available was used (see also Nimmo, *Milk, Modernity* 142).

In the guidebooks, on the other hand, it was frequently pointed out that because of harsh living conditions, the bodies of the Finnish native cattle breeds were weak, their conformation irregular, and their milk production scarce. Variance in the appearance of native cattle breeds resulted from occasional imports of foreign cattle during the preceding 300 years. Native cattle was crossbred with different foreign breeds to enhance its quality, but significant results were not achieved. As the theory of pure breeding became familiar in Finland in the late nineteenth century, understanding of separate breeds started to prevail and more attention was paid to the uniform appearance of the animals. The Eastern Finncattle herd book was founded in 1898, followed by Western Finncattle and Northern Finncattle herd books in the first decade of twentieth century. During the same decade, Ayrshire cattle herd book was also founded. Ayrshire was imported systematically into Finland from the mid-nineteenth century (Myllylä 9-11, 14-20; Lilja 56-59; Toivio).¹³

Nevertheless, the authors of guidebooks regarded the native cattle developable, and farmers were advised about how to recognize and breed better milking cows. Interest in breeding domestic animals emerged in late eighteenth-century Europe, aiming to enhance their physical as well as mental characteristics and capabilities (Brantz 85). However, during the early stages, breeders had different objectives. While some

concentrated on improving the productivity of the animals, others emphasized their “fancy” appearance, that is, their size and muscularity (Ritvo 45-81; Walton). As Holloway and Morris (4) have put it, the relationship between beauty and function may be one of complementarity or tension. These aspects are also visible in the guidebooks.

In the manuals, the qualities of a good cow usually included the abundant production of milk with high fat content. For example, according to Nylander,

Bad characteristics — that should be resisted — are, e.g., lean milk, very weak structure, weak chest or hindquarters, etc; characteristics to be advanced are of course primarily generous milking, high fat content in milk, endurance, ability to transform fodder thoroughly into milk, strong body, good temperament, etc. (*OKP I 15*)

Nylander emphasized both physical and mental features: in addition to durable and solid bodies, cows should have a suitable temperament. The guidebooks share a consensus that a good cow was even-tempered, calm, and not angry or timid. Naturally, this kind of character made the handling of the animal easier. Interestingly, Nylander maintained that “the temperament manifests itself in the animal’s motion, gaze, and movement of the ears” (*OKP I 26*). Thus, he thought that the body and its agentive action revealed the character of the cow. Nylander did not, however, elaborate on how the suitable movements and gaze could be recognized. Possibly he thought that these signs would be clear to cattle tenders who have long relationships with cattle and experience with interpreting their actions.

The manuals also emphasized invariably that the animals selected for breeding should be healthy. As early as in 1898, Sunila (8) reminded readers that high milk production was not the only quality that should be taken into account, as there had already been endeavors to raise milk production by breeding in “unnatural ways.”¹⁴ This caused weakness and susceptibility to disease. As Bert Theunissen has shown, this issue was also discussed in the Netherlands during the first half of the 20th century (667; see also Gjerløff 28). Thus, the bovine bodies were seen as recalcitrant to intensive transformations.

In addition to the functional traits of the animals, many guidebooks described the appearance of a good milking cow in detail. For example, the size of the head, the shape

of the body and different members of the body should be considered (e.g., Lindqvist 53-57, 68; Sunila 7-9; Grotenfelt 23-24; Oljelund 8; Sakari Sakarinpoika 7-8). Detailed lists of recommended traits in the appearance of the animals were typical of the oldest guidebooks in my material. The lists of preferred features call to mind what historian Anne Katrine Gjerløff has called “the milking signs” in her study on the appreciation of nineteenth-century Danish dairy cows. According to her,

the milking signs were a conglomerate of older, more or less pseudoscientific notions on how to value a cow just by looking at her. Many of the milking signs were actually just a way of knowing whether the cow was in good health — as the soft skin and bright eyes — others were folklore or rooted in unproved scientific theories. (Gjerløff 27)

The best known theory of milking signs was that of François Guenon, who launched the conceptions of “milk mirror” and “escutcheon.” These referred to the pattern of hair growth around the cow’s udder and hindquarters, which he believed would indicate its milking capacity (see McMurry 21-22; Nimmo, *Milk, Modernity* 143). Guenon’s idea of milk mirror was also presented in Lindqvist’s guidebook (see figure 3). Lindqvist suggested, however, that milk mirror should be observed along other characteristics, not as the only sign of a good milking cow (54-55). As Nimmo has pointed out, before systematic milk yield recording, the practice of selective breeding was based on the understanding that a cow’s appearance could reveal its capacity for milk production. The farmer’s task was to know and recognize the various signs and select the right cows for breeding. These ideas were also adopted and promoted by the authorities of cattle husbandry (*Milk, Modernity* 143-44), including Finnish guidebooks. According to Orland, contemporary agricultural literature was often affected by vernacular thought and personal experiences (178).¹⁵

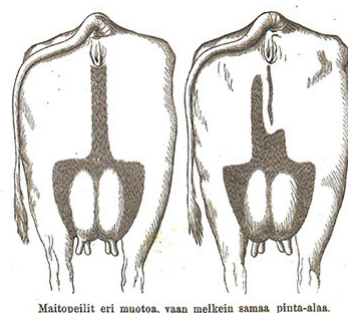


Figure 3. Lindqvist 54. “Milk mirrors of different shape but almost the same acreage.”

Gjerløff proposes that the milking signs were key factors in the assessment of the “beauty” of the cows. In addition, beauty and milk production were seen as intertwined: the cows that produced the most milk were considered the most beautiful, and the other way around, the cows that were visually most pleasing in relation to milking signs were estimated to be the best milking cows (27). Similar notions were found among Dutch breeders during the first half of the 20th century (Theunissen 652). As Gjerløff (28) and Theunissen have shown, over the course of the twentieth century, milk production and fat content of the milk were highlighted in breeding. However, according to Holloway and Morris, the relationship between aesthetics and productivity is still discussed in breeding farm animals. As they have remarked, aesthetic judgements may heavily influence the decisions made about the life and death of animals (17-18).

Although the term “beauty” was not explicit in my material, the detailed descriptions of the appearance of the animals refer also to aesthetic evaluation. Lindqvist even stated in his guidebook that the look of the cow should be “gentle and virginal” (53). In addition, he advised that a bull’s appearance should be “healthy, strong, and masculine” (ibid. 56). Moreover, although kind treatment of cattle was emphasized in the guidebooks in general, Nylander, Cajander, and Poijärvi pointed out in 1923 that a bull should not be coddled too much, in order to maintain a proper temperament (266). These kinds of remarks interestingly bring forward the gendered aspects in the understandings of the animals. This issue has also been discussed by McMurry and Bull. As McMurry suggests, the ideal characteristics of milking cow, compliance and contentment, may be seen as reflections of a wider pattern of ideas about femininity at the time (22). To use Jacob Bull’s phrasing: “This is beyond cattle mirroring rural gender relations, but an inclusion of nonhuman bodies in the performance and definition of rural masculinities and femininities” (57). Conceptualizations about feminine cows and masculine bulls also affected their treatment and, through breeding, the formation of their bodies (see also Bull 59).



Figures 4 and 5.

Nylander, Cajander, and Poijärvi 84, 85. Some guidebooks included photos or drawings of exemplary cows and bulls.

In 1906, Nylander remarked in his manual that “judgement based only on appearance is not completely valid” (OKP I 24). Although he admitted that some information about the health, developability, and structure could be gained solely by looking at the animal, the only reliable way to find out its milking ability was to measure its milk yield (24-28). Even the oldest guidebook in my material, published in 1865, suggested regular test milking: measuring the milk yield of each cow in order to find out which cows are worth keeping (Sakari Sakarinpoika 32), and similar recommendations were found in several other manuals. At first, test milking was supposed to be done by the farmers themselves, but in 1898 the first milk recording association was established in Finland, and in the beginning of the twentieth century, the number of associations grew steadily (Koivisto 18-23). As Orland has pointed out, milk recording did not only provide

accurate information on the milk yield of each cow and their hereditary potential, but it also made it possible to estimate the production costs (182). Although milk recording did not solve the problem of inheritance at the time, as genes had not been identified yet, it made a new kind of knowledge possible about animals, as well as measuring and regulating their bodies in novel ways (Nimmo, *Milk, Modernity* 151). In addition, according to Orland, the definition of different breeds and establishing herd books influenced the conceptions of good cows (178). Also in this instance, interest turned from the exterior of the bovine body to the interior.

In the case of recognizing good milking cows and selecting cows and bulls for reproduction, the object that was aimed at was a calf that would be as profitable as possible. Also in this case, the animal-made-object has two intertwined meanings. Firstly, the calf as an object made by the cow and the bull, and secondly, the objectification of all of these animals and their characteristics. However, it was frequently recounted in the guidebooks that the results of breeding were not straightforward and foreseeable. In addition, it was pointed out that the treatment of the calf significantly affected its eventual quality as a milking cow. As Sunila put it: “Parents make the calf and rearing makes the cow” (7). This highlights the interagency of humans and non-humans and their cooperation in dairy farming. To use Despret’s concepts, it may be argued that milking cows were formed in the “flow of forces” of both human and non-human agents, as well as the circumstances of their material environment.

Conclusion. At the turn of the twentieth century, modern and traditional practices met at Finnish farms (see also Peltonen, “The Iron Cage” 237, 246). The modernization process of agriculture was not linear and was met with resistance and suspicion by some and eager enthusiasm by others. In addition, discourses of traditional practices and modernizing agriculture were in many cases simultaneous (see also McMurry 23). For example, cattle tending guidebooks discussed in this study included results of contemporary science as well as practical experiences and opinions of the authors. I have used Finland as an example, but as similar changes in the significance of dairy farming happened at approximately the same time in other parts of Europe and North America, it may be assumed that my findings are applicable in a wider context as well.

The increased importance of cows was affected by technological development as well as changes in the discursive meanings of animal husbandry (see also Nimmo, *Milk,*

Modernity 70). New technology, such as separators and other machines that were used in the dairies, enabled effective usage of milk and higher income for the farmers. Although the actual work of cattle husbandry was not yet mechanized at the time, except for home separators, scientific development influenced the practices of cattle tending, for example with its specific knowledge of animal anatomy, feeding, breeding, and measuring milk yields and fodder consumption. In many cases, new information based on science started to replace traditional local knowledge. However, I agree with Orland (169) in her argument that progress in scientific research was not the only reason for improvements in cattle husbandry: changes in discursive meanings and forms of communication were also important. This was manifested in cattle tending guidebooks, which were a new method of spreading information. One of the focal messages of the manuals was emphasizing the economic significance of animal husbandry, a theme which was unfamiliar to many farmers at the time.

Along with the change in the production sector, cows turned into valuable animals, instead of being “a necessary evil.” It might be said that the earlier minimum requirement for cows was to stay alive — and even that was not self-evident in the frugal conditions. With the rise of dairy production, cows, and also their caretakers, turned into part of an industry (see Hribal 105). As Pascal Eitler has pointed out, in the context of industrialization “many humans and certain animals have been subordinated to astonishingly similar societal demands” (272). For example, guidebooks instructed cattle tenders in orderliness and a methodical approach in their practices, which often meant learning new ways of using their bodies. Moreover, commercial milk production influenced the material environments of both humans and animals, as more attention had to be paid to the size, lighting, and cleanliness of the cowsheds. At the same time, more interest and demands fell on bovine bodies, as more attention started to be paid to their productivity. By using Erica Fudge’s concept of animal-made-object, I have argued that the rising economic significance of the products produced by cattle influenced the increasing objectification of these animals. It may be maintained that bovine bodies were transformed from undemanding and enduring bodies depicted in ethnographic descriptions to demanding bodies, described in the cattle tending manuals, which needed constant attention and expert knowledge about their functions. In general, the interest turned increasingly to the insides of bodies instead of outsides that were the source of information about the animal earlier.

It is important to notice, however, that the objectification did not yield only negative consequences for cattle: for example, better feeding, hygiene, and general living conditions improved their health and welfare. Further, these improvements, along with

the investments for breeding, “influenced these animals’ mode of existence,” as Eitler (267) has put it, as the sizes of the bodies started to grow.¹⁶ Lately, contemporary animal production has been criticized for its reification of animals, and this is often seen as a rather recent phenomenon. As my discussion has shown, this objectification has long roots, dating back to the start of the modernization of agriculture, and even to earlier times.

Karen Raber has claimed that the incipient scientific research and rationalization of animal bodies in the seventeenth and eighteenth centuries inflicted alienation and disaffection in human-animal relationships (“From sheep” 78-79). In a similar manner, Richie Nimmo has maintained that the modernization of dairy husbandry turned cows into “organic machines” that the farmers used, and that the role of the cows as co-producers of milk was dissipated (*Milk, Modernity* 131). The analysis of materials used in this study does not support such views. Although cattle were described in the guidebooks on the one hand as “living machines,” on the other hand they were seen as sentient creatures with minds and emotions that work together with bodily processes. In the same way, a good milking cow was expected to have certain physical features as well as appropriate temperament. Moreover, the attention paid to the beautiful eyes and gentle looks of the calves and cows implies that cattle did not only have bodies, they also had faces and subjectivity, at least to a certain extent (see Fudge, “The Animal Face” 188). As Fudge has pointed out, objectification is always complicated and multidimensional (“Renaissance” 50). The products of cattle — milk, meat, and calves — may be seen as agents in themselves, whose features had to be taken into account when handling them.

By using Despret’s ideas of relational agency, I have been able to show that modernization of cattle husbandry was not a process that was controlled merely by humans, but that it was essentially influenced by non-human agents as well. For instance, the general material and economic circumstances of particular farms affected the possibilities to put new methods into operation. Moreover, the agency of animals was multifaceted. Although it was most self-evident in the descriptions of resistance, many instances in cattle tending in fact presumed collaboration and mutual tacit knowledge about the intentions of both humans and animals. These situations included, for example, milking and pasturing in the forests. This agential investment of cows was, and still is, a fundamental precondition of animal husbandry.

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Notes

1. In 1809, Finland was ceded from Sweden and became an autonomous grand duchy of Russia. In 1917, Finland declared independence.

2. According to Anttila, the number of agricultural guidebooks published increased rapidly after the 1850s. This was also the case with books focusing on animal husbandry and the dairy economy (53). It must be remembered, however, that even during the second half of the nineteenth century only a small proportion of rural people were literate (Luukkanen 83).

3. For more information on the backgrounds and motives of amateur folklore collectors and their relationship to the Finnish Literature Society, see Mikkola, "Self-taught collectors."

4. The original descriptions are stored in the Folklore Archives of the Finnish Literature Society in Helsinki. I have used the microfilm copies, which are stored in the Joensuu Folklore Archives.

5. By "close reading" I mean reading the materials recurrently and being attentive to the details of the texts (see Mikkola, "Odotettavissa uhkaava" 8).

6. For the similar situation for example in Sweden, see Szabó 27, 37, 39; and Canada, see Hustak 197-99.

7. In Finland and other Nordic countries, the traditional division of labor persisted especially on small farms until the mid-20th century. This meant that men mostly performed tasks outside of the farm, such as working in the fields or in the forest, while women took care of the household and the cattle. Milking cows was even considered to be shameful for men, and milk milked by a man could be regarded as unclean. Thus, the relationship between men and cows was ruled by taboos (Siiskonen 92; Sommestad & McMurry 151-52).

8. It must be remembered that at the same time agriculture in general in Finland was mechanized. Horse-drawn machines were increasingly put into operation in arable

farming and harvesting. However, the mechanization was not simultaneous throughout the whole country: Southern and Western Finland were the most progressive areas. Differences arose primarily from ecological conditions, which were favorable for arable farming in these parts of the country, and also supported the economic situation of the farms (Anttila).

9. SKS KRA stands for the Folklore Archives of the Finnish Literature Society. Next, there is the name of the respondent, followed by the abbreviation E for ethnographical material and the number of the volume in question. To provide some contextual information, I report the year of submission of the text to the archive and the place where it was gathered.

10. By the early twentieth century, dairy farming was the main source of cash income on Finnish farms, both independent and tenant farms. However, due to the small size of farms, long distances, and limited markets, the income level was fairly low. On independent farms, additional revenue was received by selling forest products. As this option was not available for tenant farmers, they often also worked outside their farms. Furthermore, approximately half of the milk and milk products were still consumed on the farms (Peltonen, "The iron cage" 236-46).

11. All quotes from the Finnish research materials have been translated by the author.

12. It was customary at the time to pasture cows freely in the forests during summer, because there was a shortage of meadows, and they were used for gathering hay for winter. Fields and meadows were rounded by fences to prevent cows from getting there (Björn, "Muuttuva maalaismaisema" 609-11). According to the ethnographic descriptions, if shepherds were used for keeping the herd together and driving away predators, they were usually children, youngsters, and elderly people. I have discussed the different aspects of forest pasturing more thoroughly elsewhere (Kaarlenkaski, "Lehmä luonnon"). According to Björn, in some parts of Finland, pasturing in the forests continued until the 1960s (*Kaikki irti* 56-57).

13. However, the focus of this article is not on the development of cattle breeds in Finland, but on animal embodiment in a more general sense. For more on the study of native cattle breeds, see, e.g., Lilja; Soini et al; Ovaska and Soini; Toivio.

14. An award-winning Finncattle cow, presented in Lindqvist's guidebook (48), produced approximately 2,600 liters of milk per year in the late 1870s. By contrast, the average yearly milk yield of present-day Finncattle cows is approximately 5,500 kilograms ("Lypsykarjarodut ja lypsykarjanjalostus").

15. This was also the case with Finnish guidebooks. According to the prefaces, many books were based on foreign literature, as well as the practical experience of the author.

16. The award-winning cow in Lindqvist's manual (48), mentioned above in note 14, weighed 330 kilograms, whereas Finncattle cows today weigh approximately 530 kilograms ("Lypsykarjarodut ja lypsykarjanjalostus").

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