



The Interface of Caretaker and Animal Well-being As a Critical Component of Sustainability

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Abstract: The food animal industry has collaborated across supply chain sectors to develop and implement initiatives that promote the sustainable production of food and fiber. While sustainability programs aim to address all three pillars of sustainability equitably (e.g., environmental, social, and economic pillars), there is often a disproportionate focus on environmental and economic initiatives despite the recognized importance of the social aspects of a system, which includes human and animal health and well-being. Assessing human and animal well-being is complex, and while these evaluations are often perceived as subjective, many objective measures are available. For example, in food animals, there are many physiological measures (e.g., heart rate, stress hormones) and behavioral indicators (e.g., escape attempts, engagement in exploratory behavior, body posture) that can be used to assess welfare. Moreover, there is an inherent connection between livestock and the people who care for them, making it essential to explore the reciprocal benefits and challenges of human–animal interactions in livestock production systems. By promoting the health and well-being of both people and animals through positive human–animal experiences, the food animal industry can work to foster more sustainable food production systems.

Key words: animal welfare, caretaker, cattle, human–animal interaction, well-being

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The Social Pillar of Sustainability

In the beef industry, there has been a clear focus in recent years on promoting and maintaining the sustainability of production systems throughout the supply chain. There has been engagement locally, regionally, and globally to develop, explore, and implement production practices that help support more sustainable beef cattle production systems (Maia de Souza et al., 2017; Greenwood, 2021; Pulina et al., 2021). Simultaneously, consumers have demonstrated a heightened interest in where their food comes from and have demonstrated a willingness to pay for credence attributes such as environmentally friendly, animal-friendly, and sustainability-friendly practices (Grunert et al., 2004; Hocquette et al., 2014). There are many active regional sustainability roundtables (e.g., U.S. Roundtable for Sustainable Beef; Brazilian

Roundtable on Sustainable Livestock; Australian Beef Sustainability Framework) that are multi-stakeholder initiatives that work across supply chain sectors to advance and support continuous improvement across all pillars of sustainability (e.g., environment, social, and economic). Although some stakeholders in the beef supply chain include animal welfare outcomes in their sustainability programs (Edwards-Callaway et al., 2024), the environmental and economic aspects of sustainability often receive disproportionate consideration compared with the social pillar (e.g., workforce well-being and animal welfare). Animal health and welfare, as well as the well-being of people and the community in which they both reside, are essential to sustainable beef production systems; these two cornerstones of social sustainability are complex and often require a multifactorial approach to assessment, which may make them more challenging

to address. Despite an ever-growing scientific knowledge base on cattle welfare, barriers to implementing best practices still exist (Tucker et al., 2015). In contrast, there is a paucity of information related to and awareness of socially responsible practices to promote the well-being of those who care for livestock.

There is an inextricable link between animal and caretaker welfare. The actions, knowledge, and attitudes of caretakers can positively and negatively impact welfare and productivity outcomes in production animals, which can also influence environmental and economic outcomes of the system. Additionally, poor animal welfare conditions and specific challenging management strategies (e.g., euthanasia or performing painful procedures) can cause job-related stress, leading to both job dissatisfaction and mental health impacts for caretakers. To have a truly robust approach to improving sustainability within the beef supply chain, attention to animal welfare and caretaker well-being must be equitably addressed with environmental and economic components in sustainability program frameworks.

The Inextricable Link Between Caretaker and Animal Well-being

Understanding the benefits and challenges people face when caring for animals can help promote continuous improvement toward more sustainable beef production systems. People interact with animals in many different capacities (e.g., companions, sources of food and fiber, and wildlife), and there is a clear, reciprocal link between human and animal well-being in all of these different human-to-animal relationships. Although there are often benefits to these human–animal interactions, there can also be negative impacts, and both types of exchanges are essential to understand. Research exploring all forms of human–animal interactions is growing across animal sectors (e.g., companion, agricultural, and zoo; Hosey and Melfi, 2014). There is a distinction in the literature between human–animal interactions, human–animal relationships, and human–animal bonds (described by Hines, 2003; Hosey and Melfi, 2014), but for the purposes of this paper, we will broadly discuss all interactions between humans and animals.

Impacts of animals on humans

The potential human benefits of interacting with animals may likely seem more evident (compared to the benefits to animals), as many people likely have personal experiences with companion animals that they

can relate to when evaluating the impacts of these interactions. There is a considerable amount of research exploring the benefits of owning pets on humans' physical health and psychological well-being (Wells, 2009; O'Haire, 2010). Additionally, exploring the benefits of animal-assisted interventions and therapies is a growing area of research (Young and Horton, 2019; Kovács et al., 2020; Ferlazzo et al., 2023). Although the literature base is vast, much of the literature includes anecdotal reports and cross-sectional study designs, and many of the studies have not controlled for other human health influences such as health habits and human social support systems (Chur-Hansen et al., 2010). Although most of the research in this area focuses on the therapeutic effects of human–animal interaction, some of the research highlights how some of these interactions may have no impact or be associated with mental or physical health challenges. For example, some of the research exploring pet ownership and mental health during the COVID-19 pandemic found that pets may have contributed to poorer quality of life (e.g., due to increased burden, etc., Phillipou et al., 2021; Amiot et al., 2022). Despite some of the inconsistencies across study designs and outcomes on what the actual benefits are of human–animal interactions (Herzog, 2011; Rodriguez et al., 2021; Scoresby et al., 2021), there is a clear research interest and investment in understanding the complexities of how we interact with and can benefit from animals in our day-to-day lives, with a primary focus on companion animals.

Most of the existing research does not explore the human impact of interacting with production animals (i.e., cows or pigs). One of the primary reasons for this is likely accessibility (Crossman, 2016); according to the 2023–2024 American Pet Products Association (APPA) report, 66% of U.S. households have a pet (APPA, 2024), and in contrast, the number of agricultural workers in the U.S. is far less (i.e., approximately 1 million employees are categorized as farmers, ranchers, or other agricultural managers; BLS, 2024). Although relatively few individuals in the U.S. interact with livestock on a daily basis, this population still represents millions of people. For those individuals, it is critical to understand how these interactions can affect them, both positively and negatively.

Although still limited in scope, there has been work reviewing and evaluating some of the physical safety repercussions related to working with production animals, primarily related to injuries from working directly with animals and disease transmission (Langley and Morgan Morrow, 2010; Lindahl et al., 2013; Titterton et al., 2022); much of the literature explores

the hazards, the factors that influence the nature of human–animal interactions (e.g., handler attitudes and behavior), and ways to reduce risk (e.g., adequate training and resources). These direct physical impacts are critically important but do not alone encompass all the impacts that working with livestock can have on caretakers. There is a significant gap in the literature related to how caretaker interactions with livestock can impact their mental health. Sometimes caretakers need to perform tasks that can be psychologically demanding (e.g., performing euthanasia or painful procedures), and although research on the impacts these activities have on livestock caretakers is expanding (Edwards-Callaway et al., 2020; Simpson et al., 2020; Wagner et al., 2020a, 2020b; Román-Muñiz et al., 2021), there is still opportunity to increase our understanding. Also, there is an opportunity to investigate how performing some of these tasks can influence livestock caretaker job satisfaction and retention, critical to the sustainability of livestock operations and the industry. This can be investigated from a positive perspective too; as with companion animals, rewarding positive interactions with livestock daily could have benefits to those who care for them. Vigors and Lawrence (2019) reported that when farmers shared stories about their livestock being content and happy, those stories were always paired with the description of the joy it gave the farmers seeing their animals engaging in the enjoyable activities. There is an opportunity to learn from the individuals that work with livestock about what they enjoy and what causes them stress when working with livestock to improve management systems.

Impacts of humans on animals

As demonstrated in the previous section, in the companion animal space most of the human–animal interaction research focuses on the human benefits, and there is little about the impacts of these human–animal interactions on the animals themselves (Hosey and Melfi, 2014; Crossman, 2016). Interestingly, this is reversed in the agricultural space; the literature base in agricultural animals focuses primarily on how human interactions can positively and negatively impact the animals, with significantly less research focus on how those interactions impact humans. Much of the prior research has focused on how the actions of caretakers can negatively impact livestock production outcomes (i.e., weight gain and milk production) and/or the reactions of livestock to these negative interactions (i.e., behavioral or physiological changes indicative of stress; reviewed by Hemsworth, 2003; Waiblinger et al., 2006;

Zulkifli, 2013; Acharya et al., 2022). There appears to be a relationship between the level of intensity, or the extent of human–animal interaction, with which certain livestock species are raised and the amount of research present, i.e., there is more literature exploring human impacts on dairy cattle and swine production as compared with cow-calf production. The negative impact of poor human–animal interactions likely receives greater attention as reduction in performance has negative economic consequences in addition to welfare impacts. Additionally, it is not only human actions that have been evaluated but also caretaker attitudes and opinions about animals, and how those influence human behavior and thus animal responses to them (Hemsworth et al., 1989; Pol et al., 2021). Several studies have demonstrated how positive attitudes of caretakers towards livestock and their welfare are related to improvement in their behavior towards animals in addition to welfare and production parameters (Hemsworth et al., 1989; Waiblinger et al., 2002; Coleman et al., 2003; Kauppinen et al., 2012). Pol et al. (2021) found that pig farmers that enjoyed working with their animals and expressed empathy towards them had the most productive herds.

In the past, much of the focus on animal welfare has also been on reducing negative experiences (i.e., reducing negative interactions with humans), but there has been a paradigm shift in that there is a newfound focus on also promoting positive experiences (e.g., the Five Domains welfare framework; Mellor and Reid, 1994). Mellor et al. (2020) discuss how interactions with humans, both the simple presence of humans at a distance and the direct contact with animals, can impact an animal's affective state either positively or negatively. For instance, Mellor et al. (2020) highlight how behavioral interactions—whether with the environment, other animals, or humans—can produce either positive or negative affects. For instance, a human handler who exhibits confidence, care, and patience can reduce an animal's flight zone, making the animal feel more comfortable with human contact. Conversely, a handler who is uncertain, indifferent, or impatient can cause the animal to become hyper-reactive and hyper-vigilant, increasing its flight zone. There has been some research conducted exploring the impacts of positive handling (i.e., gentle touching, soft voices during handling, stroking) with variable results (Lensink et al., 2000; Pajor et al., 2003; Waiblinger et al., 2004; Schmied et al., 2010), but there is certainly space to expand this area to develop practical and relevant human–animal interaction opportunities into cattle production systems. Rault et al. (2020) suggested that human–animal interactions could be

viewed as enrichment for livestock as the interactions occur daily, can be manipulated to alter predictability, and do not require additional resources as many other types of enrichment strategies do. Providing more frequent and novel opportunities for cattle to engage with human handlers may be a way to enhance welfare by increasing opportunities for positive experiences. The intentional inclusion of these types of interactions into cattle production could not only enhance welfare but also promote economic viability by enhancing production and quality outcomes. Additionally, the inclusion of these opportunities for positive human–animal interactions could also enhance caretaker well-being.

How Do We Better Understand Caretaker Perspectives?

Societal interest and concern for food animal welfare, particularly regarding animal care and husbandry procedures, are increasingly prevalent in the public domain. This growing awareness has led to a significant body of research exploring consumers' perceptions and attitudes towards animal welfare and the resulting impact on livestock care and use (McKendree et al., 2014; Clark et al., 2016; Alonso et al., 2020). While understanding how consumers and the broader public conceptualize and value food animal welfare is crucial, it is equally important to seek input from those directly responsible for the care of these animals. Livestock caretakers are on the front lines of food animal production and have the unique opportunity to positively or negatively influence animal well-being, health, and overall productivity.

Understanding caretaker perspectives is essential not only for evaluating current animal care practices but also for making practical and impactful improvements for humans and animals. While the breadth of studies is still limited in scope, in recent years, there has been an increase in research focusing on caretaker and veterinarian perspectives as they relate to livestock welfare and caretaker well-being (Edwards-Callaway et al., 2020; Simpson et al., 2020; Wagner et al., 2020a, 2020b; Román-Muñiz et al., 2021); the target populations for the majority of these studies have been caretakers and veterinarians on dairy and swine operations, again linked to the intensity of the production system.

Román-Muñiz et al. (2021) conducted focus groups with dairy caretakers on five Colorado dairy farms, asking participants questions about perceptions and stressors related to performing on-farm euthanasia;

the human–animal bond and empathy were identified as recurring themes, regardless of the participants' role on the dairy, training, or experience levels. One participant shared their sentiments about euthanizing a cow, capturing the complexity of the human–animal bond and the emotional toll euthanasia can take on workers: “*You become fond of them. Yes. You become fond of an animal. It hurts me. It is normal. It's that when you become fond of someone and they go down, well it is going to hurt . . . But the decision is so that they don't suffer. Page 10*” (Román-Muñiz et al., 2021). Another study exploring perceptions of euthanasia in a different population of caretakers also identified empathy as an important attribute in euthanasia decision-making (Australian swine industry; Rault et al., 2017), again highlighting the complex interface of humans and animals and suggesting that empathy plays a role not just in the well-being of animals, but also in the well-being of the caretakers themselves. While past research has predominantly focused on perceptions and stressors related to performing euthanasia (Edwards-Callaway et al., 2020; Simpson et al., 2020; Wagner et al., 2020a, 2020b), recent attention has shifted towards understanding the perceptions, attitudes, and knowledge of slaughterhouse workers (Wigham et al., 2020; Edwards-Callaway et al., 2022; Pastrana-Camacho et al., 2023). This shift reflects a growing awareness of the broader human–animal interaction within production settings beyond just euthanasia scenarios. However, there is still much to explore regarding caretaker perceptions and stressors related to general animal care. Understanding these aspects can provide valuable insights into improving animal care practices and supporting caretakers in their daily job-specific roles, ultimately benefiting both animals and those who care for them.

There is very little research paralleling this exploration of caretaker perspectives and attitudes with a specific focus on cattle and caretaker well-being within the feedlot sector. Several studies have focused on feedlot workers, but the research has been more narrowly focused on general job stress and safety (Ramos et al., 2018; Ramos et al., 2021a, 2021b; Carlo et al., 2023). Some factors—including those related to mental and physical fatigue, along with the need for recovery in feedlot workers—have been investigated to better understand occupational stressors (Ramos et al., 2021a), though this body of research falls outside the scope of the current paper. In one 2019 study, Ridge et al. explored Texas feedlot caretakers' perceptions and attitudes toward euthanasia and cattle care. Survey respondents, which included a sample of

doctors, pen riders, processors, and managers, were asked to rate their agreement with the statement “Beef cattle behavior is affected by the way we treat them,” garnering mixed responses overall (Ridge et al., 2019). In the same study, the authors found that workers’ overall perceptions of beef cattle, euthanasia, and job satisfaction differed by their role on the feedlot. These findings underline the importance of understanding not just how perceptions and attitudes towards cattle care and well-being differ across the type of production system (e.g., swine systems vs. feedlot systems), but also how they differ across varying job roles at a single operation (e.g., feed truck drivers vs. processors). Because the nature and extent of human–animal interactions differ by role, this may necessitate tailored approaches, such as role-specific training and support, to address human and animal well-being most effectively. For example, it is critical for caretakers who interact with animals the most to have the best understanding of how their behavior and attitudes impact animal health, performance, and well-being. Moreover, while the management intensity of cattle on feedlots differs from other production systems like dairies, many feedlot caretakers still experience frequent and intense interactions with the animals in their care. Therefore, understanding their perceptions and attitudes toward cattle care and well-being is critical for implementing targeted educational efforts and interventions.

Future Opportunities and Needs

An area of growing research includes exploring technology in agriculture and its role in human and animal well-being. As precision livestock technologies, including wearable technology, robotics, drones, and remote sensing technologies, become increasingly common and allow for more efficient and targeted use of resources, it will be critical to understand the potential benefits and challenges of these technologies for both livestock and the people using them (Schillings et al., 2021). For example, a benefit of remote sensing technologies is that they can be used to monitor animal health and behavior and detect signs of disease early and often (Tedeschi et al., 2021). While these technologies also reduce the need for manual labor and exposure to potentially hazardous conditions, there may also be unintended consequences or challenges associated with their implementation. In a review by Hostiou et al. (2017), the authors indicate that there are many positive aspects to precision

livestock farming, such as the time savings associated with a reduction in workers having to do repetitive physical tasks (e.g., feeding and milking). However, the authors also indicate that technologies on farms will inevitably change the way that farmers interact and work with their animals; for example, a switch from manual to robotic milking reduces the number and length of human–animal interactions and could potentially result in animals that are more fearful of humans, thus reducing their overall well-being (Hostiou et al., 2017) and warranting careful consideration.

Going forward, interdisciplinary approaches and shared decision-making will be more critical than ever for fostering more sustainable food production systems; for example, combining insights from occupational health and animal welfare experts can create a holistic understanding of production environments (Lund et al., 2006). This type of collaboration is beneficial and necessary to help identify shared stressors affecting both animals and workers and aid in developing interventions that improve the overall health and safety of the production system. Such efforts will be essential for addressing the multifaceted challenges of food animal production and ensuring the long-term sustainability of these systems.

As mentioned, the way we conceptualize human–animal interaction and animal welfare has evolved significantly—from focusing solely on mitigating negative experiences for livestock to now promoting positive and rewarding experiences as well (Mellor and Reid, 1994; Kells, 2022). As Hemsworth (2003) aptly puts it, “. . . the rewarding elements of human–animal interactions for animals should be identified and the opportunities to utilise these rewarding elements to alleviate some of the aversive interactions, that are at times necessary in livestock production, should be explored. Page 196.” This paradigm shift towards recognizing and fostering positive experiences represents a promising path forward for enhancing well-being and improving overall productivity in production systems. Continued emphasis and deliberate integration of this concept into animal welfare programming, existing frameworks, and training and educational resources will be important looking ahead.

Conclusion

In recent years, there has been a heightened interest and emphasis from stakeholders in every sector of the food production chain to promote more sustainable food systems, which encompasses the health and well-

being of people, animals, and the environment on which these systems depend. This holistic approach to sustainability is crucial for ensuring the long-term viability of our food systems. While significant strides have been made in addressing environmental sustainability, such as reducing carbon footprints and optimizing natural resource use, there has been comparatively less focus on the social aspects of sustainability. These aspects include worker well-being and the complex interplay between humans and animals within these systems. Foundational research has been conducted to better understand livestock caretakers' perspectives and attitudes with a focus on human and animal well-being, but the work is limited in scope, and there is a noticeable gap in the populations of caretakers and production systems that have been examined. To achieve truly sustainable food systems, it is essential to address all three pillars of sustainability—environmental, social, and economic—equitably. The social pillar, in particular, is crucial for ensuring a secure and flourishing workforce for generations to come.

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