Legitimating Visions, Mitigating Risks: Industrial and Agrarian Strategies to Resolve the Enigma of Animal Welfare

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Abstract

The tension between industrial and agrarian systems is well traveled territory in both environmental and rural sociology, but the needs, interests, and experiences of animals as meaningful subjects in the context of these systems has received far less attention. In this paper, we accordingly analyze how public understandings of risk and legitimacy are actively negotiated by industrial and agrarian meat producers in the aftermath of animal welfare controversies. More specifically, we examine how animal welfare is enacted through these two paradigms, respectively, by analyzing Temple Grandin's industrial slaughter reforms and on-farm (agrarian) slaughter. We argue that all concerned meat producers must make difficult decisions about which animal welfare risks they wish emphasize or de-emphasize, and that neither system can eliminate these risks entirely.

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Introduction

Industrialization and consolidation in the meat and livestock industries in the United States has resulted in the vast majority of US livestock being raised under intensive confinement and slaughtered in high throughput packing houses (Wohlgenant, 2013; Blanchette, 2018). In response to public outcry over the treatment of animals in these facilities (see Norwood and Murray, 2018; Tonsor, Lusk and Schroeder, 2019), legislatures, government agencies, and companies have increasingly taken steps to address animal welfare issues (Sullivan et al., 2017; Grethe, 2017; Tonsor and Wolf, 2019).[1] The Proposition 2 (2008) and Proposition 12 (2012) ballot initiatives in California further pushed the industry to reform its animal welfare practices, both in the state and nationally. Alongside, and to some extent in opposition to, the dominant system of industrialized production, there exist alternative livestock production systems which often describe themselves in contrast to conventional industrial animal producers. This method of production accounts for only a fraction of the meat sold in the US (Mathews and Johnson, 2013) but the demand for these products has grown post-COVID19 (Nickelsburg, 2020). In this paper, we explore the persistent tensions that lie between (and within) these competing systems of meat production, specifically as concerns animal welfare.

While we recognize that meat production can take myriad forms, for the purposes of this paper we identify two ideal-types of meat production, which we refer to as 'industrial' and 'agrarian' (see Thompson, 2015), characterizing the ends of a broad spectrum.[2] Industrial discourse and practice tends to correspond to large-scale intensive operations that use some combination of grain feeding, confinement housing, prophylactic antibiotics, and wholesale and/or mainstream retail. Industrial meat producers' goods are made affordable and accessible through economies of scale, yet this same process also makes these goods homogenous and impersonal. Advertisers, restaurants, and retailers can aestheticize, enchant, and add value to these types of products, but their cultural authenticity remains subject to increasing consumer scepticism. In contrast, the agrarian discursive strand is often taken up by smaller operations that typically use some combination of extensive production methods, agroecological practices, traditional knowledge, grass feeding and finishing, outdoor, pasture or free-range housing and feeding, organic labelling, minimal antibiotic use (e.g., only for treatment of illness), and local marketing through farmers markets, local retailers, or direct to consumer channels (Mathews and Johnson, 2013). By producing niche, specialized products, agrarian meat producers lay claim to the 'lost art' of pastoral living, terroir tastes, craft butchery, close direct contact between farmers and consumers, and the nostalgic yearning for an uncorrupted relationship between animals, land, and people that is sustainable and nurturing (Weber et al., 2008).

The discord between industrial and agrarian systems is well travelled territory in both environmental and rural sociology (Guzmán et al., 1997; Foster 1999; Buttel, 2001; Guzmán and Woodgate, 2013), but the needs, interests, and experiences of animals as meaningful subjects in the context of these systems has received far less attention (see Bohr and Dunlap, 2017; Twine, 2020). This is unfortunate, as farmed animals number in the billions across the globe (Mehrabi et al., 2020), and 'all vertebrates should be considered capable of experiencing pain (National Research Council, 2009, 23)'. In recent years, a core constituency of determined scholars has steadily increased the visibility of animals' interests in both environmental and rural sociology (e.g. Tovey, 2003; Buller and Morris, 2003, 2014; Kendall et al., 2006; Morris and Kirwan, 2006; Irvine and Ellis, 2010; Deemer and Lobao, 2011; Ellis, 2013; Pellow and Brehm, 2013; Fitzgerald and Pellow, 2014; York, 2014; Chiles, 2017; Bassi et al., 2019). To date, this emerging body of work has extensively critiqued the moral status of animals in the context of industrial capitalism (Miele and Bock, 2007; Ransom, 2007; Maciel and Bock, 2013; Gunderson and Stuart, 2014; Stuart and Gunderson, 2020). Environmental sociologists and rural sociologists have generally been far less critical of the agrarianism approach to animal welfare. This parallels the broader

[1] Our paper is grounded in the broadly recognized category of 'animal welfare' as defined by the World Organization for Animal Health (2021:1), wherein 'animal welfare means the physical and mental state of an animal in relation to the conditions in which it lives and dies'.

[2] In practice, there is a sizable grey area between the industrial and agrarian systems: many certified organic operations are very large, many small-scale ranches use conventional rearing practices, larger operations are experimenting with certain types of agroecological practices, and so on.

public discourse on animals and the environment, wherein many animal protectionists have sought common cause with environmentalists on factory farms (Holt, 2008) and have thus been reluctant to alienate small farm defenders (Freeman, 2020). In recent years, however, a slowly growing chorus of animal ethics scholars has begun to critique the agrarian vision of animal welfare as well (Weis and Ellis, 2013; Ellis, 2014; McWilliams, 2015; Thompson, 2015; Stanescu, 2019; Lundström, 2019).

In what follows, we contribute to this discussion by comparing how industrial and agrarian meat producers articulate their own vision of how animal welfare risks 'should' be addressed. We then examine these visions in further detail by analysing Temple Grandin's industrial slaughterhouse reforms and the agrarian practice of on-farm slaughter. While our paper emphasizes industrial and agrarian production in the United States, we occasionally refer to animal welfare studies that have been conducted elsewhere, and the basic ethical tensions that we describe in this paper are broadly applicable to other geopolitical contexts.[3] In short, we argue that many of the tensions and contradictions that disrupt the legitimacy of meat are longstanding and likely to persist indefinitely, regardless of the material and discursive resources that are deployed to address them.

Framing Risks to Animal Welfare: The Discursive Struggle for Legitimacy

The concepts of legitimacy and risk are ideally suited to comparing and contrasting the industrial and agrarian paradigms, and they moreover have a deep and storied tradition in environmental sociology (e.g. McLaughlin and Khawaja, 2000; Frickel and Davidson, 2004; Marshall and Goldstein, 2006; Pellow and Brehm, 2013). At its core, legitimacy is a reflection of social acceptability, and a person, object, practice, or institution is legitimate to the extent that it is taken for granted and unquestioned (Johnson, Dowd, and Ridgeway, 2006). Classical sociological theorists have traditionally used the concept of legitimacy to analyse citizens' acceptance of state power. Habermas (1975), for example, argued that the contradictions intrinsic to late-capitalist societies resulted in a loss of public confidence in state governance (legitimation crises), while Giddens (1984) conceptualized domination, signification, and legitimation as comprising the core structural features of social systems. However, in an increasingly consumer-driven postmodern world, where political decisions are made daily through one's participation in the marketplace, the process by which producers, mass media, and consumers legitimate large industries also requires critical attention. Public reactions to meat industry controversies also vary according to the specific context in which people respond to them. For example, as a citizen, someone might vote to support a cage-free ballot initiative, but as a consumer, they may well continue to purchase conventionally sourced eggs (Norwood et al., 2019).

The repositioning of the consumer within the market in recent decades maps onto the shifting of scientific authority over a similar period, as described by Beck (1992). Throughout the twentieth century, experts and scientific institutions maintained a privileged position of power by which they could authoritatively identify risks and determine 'appropriate' social solutions (Beck 1992; Mythen, 2004). This is no longer the case in late modernity, where science is no longer the primary means by which risks are understood or legitimacy is maintained. For many in the animal agriculture community, this has been a difficult transition to come to terms with (Rollin, 2011). The rationality of science, while not replaced or rendered illegitimate, is increasingly butting up against a 'social rationality' of cultural values, norms, and knowledge beyond science (Beck 1992; Mythen, 2004). The broader societal tension between these epistemic communities maps closely with the tensions between the two dominant meat production systems, whereby industrial systems are grounded in techno-scientific rationality and agrarian systems are grounded in social rationality. In the context of meat production, social rationality is typically understood through consumer demand for 'better' meat. Here, industrial and agrarian producers effectively compete with one another to emerge as the most dependable provider of legitimate meat in the eyes of consumers. Effectively framing animal welfare risks is critical to these actors' ability to secure their legitimacy in the eyes of concerned publics. By invoking the language of risk, we are referring to the extent to which certain aspects of animal welfare are prioritized and protected

[3] See also Carey et al. (2020, 301)'s observation that animal welfare preferences and institutional arrangements in one region can become 'globalized' and thus extended to other markets.

or not. Different ways of framing the issue of animal welfare – and risks thereto – —underpin the material and discursive strategies mobilized to establish legitimacy with consumers. These are important distinctions to understand, as different types of producers vie for legitimacy with consumers, and in so doing shape discourses of what meat production 'ought' to look like.

The Industrial Discourse on Animal Welfare

Industrial meat producers and retailers leverage their structural position within the global food system to secure stability and symbolic capital, in large part by continually refining and tweaking the industrial apparatus through the use of science and standards (Ransom, 2007). In the US context, the meat industry has developed close relationships with government agencies, legislators, and policymakers, and these partnerships have been used to reframe welfare and risks to welfare in industry-friendly terms (Ransom et al., 2010). With respect to animal welfare crises, 'many companies acknowledge national regulations in their own animal welfare policies as a means of gaining legitimacy with national governments and the corresponding national public' (Ransom, 2007, 32). This has been further facilitated by the institutionalization of neoliberal discourse, wherein government oversight and regulation of the market has been scaled back and corporations have taken the initiative to set the rules and standards that govern the economy (Busch, 2000, 2011; Konefal et al., 2005). Given stiff price competition and the natural limits to the total quantity of food that consumers can buy, private standards have been particularly important in helping retailers to expand their market share by focusing on quality and value-added products like 'black angus' certified beef (Busch, 2000, 2011; Konefal et al., 2005). Quite often, however, corporations' rules of classification, measurement, and grading 'mask controversy and vested interests and allow actors to exclude, conceal, and mystify possible alternatives' (Ransom et al., 2010, 160).

Defining animal welfare in quantifiable and measurable ways places emphasis on attributes that are easily recorded, aggregated, and expressed as rates or averages. This facilitates the standardization, auditing, and enforcement of standard veterinary health measures concerning, for example, mortality, morbidity, and growth – what Appleby (1999) would describe as the body domain of animal welfare (Thompson, 2015). In essence, these narrowly defined metrics serve the interests of industrial producers by neglecting other aspects of animals' experiences that are less amenable to uniform measurement and scientific interventions. The challenge of accurate and comprehensive on-site measurements is further compounded in production systems that lack unannounced and longitudinal auditing.

Industrial meat producers also secure partnerships to develop standards with third-party organizations and/or academic entities that can further testify to their legitimacy. Here, as noted by Carey et al. (2020, 285), a certified label like 'sow stall free' effectively 'corporatizes animal welfare through the co-optation of activism against the factory farming of animals'. In exchange for the blessing of these entities and actors, the industrial meat producers allow these groups to leverage their influence and get things done that would not happen without corporate cooperation. The work of Temple Grandin, an animal sciences professor at Colorado State University, is an exemplar of this phenomenon.

Temple Grandin and Science-Based Risk Framing

For decades, Grandin has been a leading voice on animal welfare issues and has been praised by corporations and activists alike for promoting livestock handling recommendations, slaughterhouse designs, and consulting work. Nearly half of all beef slaughterhouses in North America are based on her designs, and she has also developed 'an objective scoring system for assessing handling of cattle and pigs at meat plants' (Grandin, 2021). Her personal narrative about living with autism, along with a dramatized biography on HBO, has further legitimized her with the public by positioning her as a charismatic science communicator (see Lion, 2020). Grandin's work is also influential because she symbolically affiliates herself with dominant institutions and discourses in the broader society: scientific progress, improving production efficiency, and affective revulsion at animal suffering (Carey, 2011; Lion, 2020).

When companies that enlist Grandin find themselves in the midst of controversy, these companies symbolically affiliate themselves with the principles of animal welfare by pointing to their work with Grandin in an effort to insulate themselves from criticism. At the same time, the companies, and Grandin herself, will distance themselves from disgraced workers and suppliers by labelling them as bad apples that did not follow company guidelines or Grandin's instructions. If the companies are willing to negotiate with Grandin and show improvement to her liking, she will publicly defend them, but if they do not, she walks away. This has sometimes led her to take apparently contradictory positions.

One example of Grandin's 'walk away' tactic can be found with the negative publicity that engulfed KFC and their supplier Pilgrim's Pride in the mid-2000's. In 2004, an NBC NEWS article on Grandin mentioned that KFC chose Grandin to coordinate its supplier animal welfare audits because she was 'the best possible professional' (Bonné). One month later, however, People for the Ethical Treatment of Animals released a video that depicted Pilgrim's Pride slaughterhouse workers 'jumping up and down on live chickens, drop-kicking them like footballs and slamming them into walls, apparently for fun' (McNeil, 2004). According to the undercover investigator who shot the film, the workers were trying to 'alleviate boredom or vent frustrations' at having to work late, behaviour that was normally tolerated by the supervisor except when plant inspectors were visiting. Grandin told The New York Times that the behaviour was 'absolutely atrocious' and 'they need to fire the plant manager' (McNeil, 2004). KFC called for the workers to be fired and threatened to end their relationship with Pilgrim's Pride if the incidents continued. Pilgrim's Pride and KFC further said that they would send Grandin – who served on KFC's animal welfare advisory board – to the plant to further investigate. KFC's public shaming of the Pilgrim's Pride facility was somewhat ironic, as the same facility had won KFC's 'Supplier of the Year' award in 1997. The fact that such a damning episode occurred at an award-winning facility showcases how quickly a meat producer's legitimacy can be shattered. By 2005, Grandin and three other consultants on KFC's Animal Welfare Advisory Committee had resigned, having felt 'used', particularly after being asked to not discuss KFC's animal welfare policies in public (Martin, 2005).

A similar event involving McDonald's and Smithfield Foods occurred in 2011, but in this case, Grandin ultimately chose to publicly defend the company. In 2004, Grandin and Dr Stan Curtis wrote that the current Animal Welfare Management System for Murphy-Brown, a Smithfield subsidiary, 'could serve as a model for the entire U.S. pork industry (Smithfield Foods, 2004)'. Later, in 2007, Smithfield announced that it would end the use of gestation stalls, a move praised by HSUS – the Humane Society of the United States (The Virginian-Pilot, 2013). In 2008, McDonald's issued a statement acknowledging Smithfield's commitment 'to the well-being of animals' (McDonald's Corporation, 2008). By 2010, however, 'HSUS found that Smithfield pigs were living in hellish conditions where basic needs were systematically unmet' (McWilliams, 2011). HSUS' investigative footage had been shot at a Murphy-Brown plant, the same company Grandin had previously described as 'a model' for animal welfare (McWilliams, 2011). After an investigation, Murphy-Brown fired three of the workers (Philpott, 2013).

Unlike KFC, Murphy-Brown and Smithfield were willing to continue negotiating the path forward with Grandin, and she stepped forward to shield them from criticism. While Grandin was critical of the company's practices on the video, she qualified her remarks by saying 'I'm not going to defend them on that. They did stuff that was definitely wrong. But when you looked at some of the older undercover videos, it was way, way worse (Walzer, 2011a)'. This statement is puzzling, as Grandin and her colleague had praised Murphy Brown's practices seven years earlier, in 2004. A year later, in 2011, Grandin starred in a Smithfield promotional film that commended both her life accomplishments as a 'groundbreaking animal advocate' (Walzer, 2011a), and Murphy-Brown's commitment to animal welfare and social responsibility. Grandin used the opportunity to praise Murphy-Brown – which had just been badly embarrassed by the HSUS video – for its longstanding commitment to proper animal handling. HSUS later filed a complaint with the U.S. Securities and Exchange Commission, claiming that Smithfield's film constituted false advertising (Walzer, 2011b). In 2015, Smithfield announced that it had committed, for a second time, to a plan to phase out the gestation crate and was again praised by HSUS (Walzer, 2011c). After Smithfield declared that it had accomplished this goal, in January 2018

(Sauers, 2018), the activist group Direct Action Everywhere released a series of undercover videos alleging that gestation crates were still being used at Smithfield facilities – a claim that Smithfield disputed (Matthews, 2018).

In short, there is an inherent contradiction in Grandin's legitimation strategy. When things go according to plan, she wants those instances to be understood by the public as the baseline for how the entire industry works. When things do not go well, however, she wants those involved to be treated as 'bad apples' that do not reflect upon the entire industry. In 2014, for example, Grandin (2014, 467) wrote 'I have worked over 40 years in this industry and I am proud of the improvements I helped achieve. We need to show it'. Grandin has also used examples of her idealized system in action to try to minimize the negative publicity that emerges from activists' undercover videos. For example, Grandin noted in an American Meat Institute brochure that 'It should be reassuring to know that 50 percent of cattle and 20 percent of pigs are processed in plants that use my designs', even though she had previously acknowledged that her own systems often fail to resolve animal welfare challenges due to inadequate implementation (Grandin, 2006, 129).

On numerous occasions, Grandin herself has openly acknowledged that some degree of animal suffering is endemic to all systems of meat production, even at the facilities that operate according to her idealized system. In 2013, she rhetorically asked 'Can you make a slaughterhouse perfect? No, nothing in this world that's a practical thing can be made perfect' (McClelland, 2013), and she has also stated that 'it is totally impossible to stun every animal perfectly' (Grandin, 2011). The broader question, however, concerns what constitutes a socially acceptable level of risk. As noted by the U.S. General Accounting Office, if it is acceptable for 95% of animals to be stunned at the first attempt (i.e. Grandin's target rate), this 'indicates that hundreds of thousands of animals were not stunned on the first try' (General Accounting Office, 2004, 16; quoted by Singer and Mason, 2006, 67). It is therefore 'probable that anyone who eats meat will, unknowingly, from time to time be eating meat that comes from an animal who died an agonizing death' (Singer and Mason, 2007, 68).

Grandin's work, along with third-party certifications and labels, may help to bolster meat producers' legitimacy, but the aforementioned incidents demonstrate the fragility and logical inconsistency of these promotional efforts. Activists' and journalists' efforts to expose the limitations and discrepancies of these schemes can potentially make companies look even worse than they did prior to certification.

The Agrarian Discourse on Animal Welfare

While Grandin-esque reforms are one pathway to address the doubts and scepticism that continue to follow the meat industry, agrarian producers tend to frame animal welfare very differently, and as such have pursued an alternative path. Agrarian producers constitute a small fraction of the meat and poultry industry and cannot compete with the larger producers on price or availability (Johnson et al., 2012). To this end, agrarian producers and their advocates symbolically affiliate with agrarianism, a longstanding motif in American society (see Thompson and Coskuner-Balli, 2007; Hagenstein et al., 2011; Gillespie, 2011; Press and Arnould, 2011). Here, agrarian producers leverage their cultural capital by arguing for the authenticity and tradition of small-scale farming and their participation in the local community. DuPuis (2000, 293), for example, notes that when compared to smaller companies, larger companies 'cannot make the same neighborly claims with the same legitimacy'.

The small scale of agrarian operations is also purported to reduce the incidence (Alali et al., 2010), spread, and scale of foodborne hazards compared to the amplifying effect of large-scale production (Juska et al., 2003, 11). This signals a different way of framing risk. Agrarian producers further rely on their locally embedded knowledge and close relationship with individual animals to mitigate risks to the environment, humans, and animals. They moreover distance themselves from practices that are commonly associated with industrialized production, such as long-distance transportation, prophylactic antibiotics, and pathogenic proliferation (Juska et al., 2003; Klar, 2016; Stuart and Worosz, 2012). From the agrarian perspective, risks are best managed by

'mimicking relationships found in nature' rather than controlling nature (Pollan, 2006, 215).
Agrarian producers and their advocates also maintain that by avoiding intensive confinement, extensive farming operations improve animal welfare as they allow livestock to get outside, move freely, engage in natural behaviours, and have satisfying affective experiences (Pollan, 2006). This particular welfare focus seeks to preserve the expression of species-typical behaviours, satisfaction, and diverse affective experiences – what Appleby (1999) refers to as the nature and mind domains of animal welfare (Thompson, 2015). It is through their perceived close connection to nature and personalized stewardship that agrarian farmers feel specially-equipped to assess the qualitative and subjective indicators of animal welfare (Pollan, 2006; Thompson, 2015).

Despite the idealized agrarian imaginary, animals raised in extensive conditions also face 'significant welfare challenges' (Turner and Dwyer, 2007). Chickens raised outdoors, for example, can easily become overcrowded. This can result in feather pecking, and many pastured poultry farmers rely upon the industrial technique of debeaking as a convenient preventive measure (Sossidou et al., 2011). Attempts to enhance the nature and mind domains of animal welfare thus create new risks, particularly in the body domain. Due at least in part to practical and fiscal constraints, many small-scale farmers either neglect the costly veterinary care their animals require, or subject them to body modifications that inhibit species-typical behaviours such as pecking (Thompson, 2015). There are numerous painful husbandry practices that are present in 'virtually all management systems' (Stafford, Melor, and Vogel, 2021, 114): castration, dehorning, disbudding, ear notching, and ear tagging in cattle; castration, tail docking, ear notching, and ear tagging in sheep; and tail docking in pigs. Free-range systems also pose their own unique challenges. For example, 'pigs farmed outdoors, especially sows, often have rings, clips, or pieces of wire placed in their noses to prevent digging and rooting' (Stafford, Melor, and Vogel, 2021, 114). The castration of male pigs, which is done to improve the flavour of pork, is 'still common in most countries' (Bonneau and Weiler, 2019, 884). Castration without anaesthesia is intensely painful, and even with anaesthesia, serious complications can arise (McWilliams, 2015).

Biosecurity, Suffering, and On-Farm Slaughter

Support for on-farm slaughter is another important component of the agrarian discourse on animal welfare. Here, agrarian proponents argue that an animal 'killed on its own turf doesn't know what hits it' (Estabrook, 2010, 1). On-farm slaughter also avoids the process of transporting animals long distances in crowded trailers (in potentially inclement weather), which frequently results in animal stress, injury, and/or yield loss (McCorkell et al., 2013). Proponents also defend on-farm slaughter as being hygienically superior (Klar, 2016), and demand for on-farm slaughter often spikes shortly after media reports of foodborne illness outbreaks from meat (Estabrook, 2010). In short, supporters of on-farm slaughter thus argue that it has significant benefits with respect to cost-savings and flexibility, both of which are particularly important for small-scale operations.[4] As one small farmer argues in an editorial:

> *I want to know what my animal has eaten, how it has been treated through life, and that it has been killed humanely. My customers wish for these same assurances, and understand that cheap meat bears other costs – of antibiotic and hormone contamination, risks of pathogens, and the suffering caused when 400 beef are inhumanely slaughtered every hour in horrific factory 'environments'. (Klar, 2016, 1)*

In the US, a combination of increasingly strict legal restrictions on on-farm and low-capacity slaughter made access to these forms of slaughter more difficult or impossible for years (Worosz et al, 2008), leaving agrarian producers with few options other than to send their livestock to commercial abattoirs. Some localities loosened these restrictions in the aftermath of industrial meat processing shutdowns during COVID-19 (Nickelsburg, 2020). In the meantime, large slaughterhouses continue to worry that bringing in livestock from multiple small meat producers increases biosecurity risks. Industrial producers are also more likely to have

[4] In some states, only the individual who purchased the animal, not the farmer, is permitted to perform the slaughter, in others, only licensed mobile abattoirs may perform the slaughter, and in many other states the practice is banned altogether.

consistently followed strict biosecurity procedures, unlike small meat producers who lack the capacity or resources to do so (Johnson, Marti, and Gwin, 2012, 17). Prior to slaughter, pasture-raised poultry systems are exposed to wildlife, parasites, and bacteria, placing these birds at risk of acquiring numerous diseases (e.g., pasteurella) or becoming pathogen carriers (e.g., E. coli) (Sossidou et al., 2011; McWilliams, 2015).

On-farm slaughter is conducted in non-uniform settings and accordingly leads to a wide array of different outcomes. There is also conflicting evidence as to the effectiveness of certain types of on-farm slaughter methods. For example, one recent study found that manual neck dislocation was a highly effective method that resulted in 'rapid loss of brain function… [and] no evidence of reduced performance with time/bird number' (Martin et al., 2018, 1). A different study emphasized that this technique was physically demanding and time-consuming, and that the effectiveness of this technique varied widely according to operator fatigue and 'birds' weight, size, and age' (Jacobs et al., 2019, 2).

Another method for stunning and killing larger animals on-farm is to use a rifle (in contrast to the captive bolt gun common in industrial abattoirs), and this is 'a popular choice for euthanasia in North America' (Woods and Shearer, 2021, 362). Moreover, according to Iowa State Extension, 'in most circumstances on the farm or ranch, gunshot is the only practical method of euthanasia' (Shearer and Ramirez, 2013, 3). However, only certain bullets and shot placements can guarantee that the animal is immediately stunned (Retz et al., 2014), and failures to instantly stun animals with the first rifle shot can result in death being painfully prolonged by minutes (e.g. USDA, 2013). Moreover, although practitioners of on-farm slaughter in the US are expected to comply with state regulations, inspection of on-farm slaughter is sporadic compared to industrial producers, thus providing ample opportunity for compliance failures (Evancie, 2014).

Any discussion about the intentional forms of on-farm slaughter would also be remiss without attending to the unintentional forms of on-farm slaughter, that is, the incidental killing that takes place by other means in agrarian systems. For example, when exposed to open fields without shelter, chickens are unable to rely upon their natural protection strategies and can easily be victimized by predators. Pastured poultry also suffer from high rates of smothering and shorter lifespans (Sossidou et al., 2011). Many agrarian poultry farmers openly admit that veterinary care for their chickens is too expensive, and will thus kill potential predators (McWilliams, 2015). With respect to agrarian swine production, lactating sows in free-range systems can unknowingly crush their young when lying down, thus resulting in a pre-wean mortality rate of up to 25% (Seibert and Norwood, 2011, 11-12). This is a problem that industrial producers have long addressed by confining sows to farrowing crates, which pose their own set of well-publicized welfare concerns. Given the dual problems of farrowing crates and crushing, pig farmers are essentially caught in a bind, as crushing in free-range systems can only be managed by careful 24-hour surveillance of lactating sows. For many small operations, this type of management is extremely laborious and thus impractical (McWilliams, 2015). Upon reviewing two decades of studies on this method of husbandry (n=238; 2000-2020), Pietrosemoli and Tang (2020, 223) concluded that 'pasture pig production systems present specific challenges to animal welfare that are inherent to the nature of these systems where producers have little room to make improvements'. In short, returning to pre-industrial husbandry practices can often lead to unintended consequences that have negative ramifications for animal welfare.

Lastly, the agrarian practice of avoiding antibiotics poses another significant risk of unintentional on-farm slaughter. Under USDA regulations, any application of antibiotics to livestock requires them to be sold as 'conventional' animals, thus resulting in profit losses for organic producers. Ironically, according to organic veterinary specialist Hubert Karreman, the withholding of antibiotics has been more of a problem with his clients at smaller farms:

> *Antibiotics save lives. Using them in a timely fashion prior to any permanent damage is a critical component in the responsible use of these life-saving medicines… Sometimes a farmer operating a small organic farm will want to know everything possible they can do for an animal (short of giving an antibiotic). All-natural treat-*

> *ments, regardless of scientific merit, will be tried to save 'Bessie', but then the farmer realizes only too late that an antibiotic should have been used. This is probably unique to small organic farms, since a large organic farm may give the antibiotic more quickly because there is a ready replacement animal for the one to be removed. The animal that must leave a large organic farm does not create as much loss as an animal removed from a small organic farm. (Karreman and Fulwider, 2021, 280)*

In sum, the above examples showcase the diverse, multi-faceted, and (quite often) expensive welfare complexities that confront agrarian producers. Each operator will also face their own unique set of challenges.

Discussion

Agrarian producers, by symbolically affiliating themselves with the agrarian ideology and marketing themselves through direct exchange, have circulated a countervailing orientation to the dominant (industrial) risk discourse. At the same time, the inaccessibility and price of local meat is a constant threat to its mainstream viability, and hence its overall legitimacy in the eyes of the broader public. Moreover, while agrarian meat producers must draw firm boundaries between themselves and industrial meat producers in order to retain their symbolic capital (i.e. their legitimacy), the agricultural methods by which these boundaries are drawn introduce their own set of practical and existential dilemmas. Moreover, as agrarian production techniques are highly context-sensitive, they result in a broad spectrum of animal welfare outcomes.

Industrial producers seek to avoid these irregularities and idiosyncrasies by turning to science and technology. Science serves as a relatively stable way of ordering relationships between actors in the complex globalized food production system, which allows for the generalization of standards (Busch and Bain, 2004; DeLind and Howard, 2008). It also offers a way of both defining problems and deriving solutions, and it can serve as a means by which to restore legitimacy. Risks can also be defined and experienced through different socio-cultural and cognitive frames, such as emotional responses and specific definitions of quality (Jasanoff, 2007). It is becoming increasingly common for publics to 'test and contest the framing of the issues that experts are asked to resolve' (Jasanoff, 2003, 397). As noted by Rollin (2008, 15), 'science can give us facts relevant to animal welfare… [but] to say that the animal is 'well-off' or 'not well-off' requires a value judgement on what counts as well off'. Decision-making on animal welfare measurement in the global cage-free egg supply chain is a case in point. Here, 'at stake are different players' attempts to stabilize and commodify different ways of connecting the food chain among earth and sun, hen and farmer, distributor, marketer and retailer, and consumer, that will differentiate non-caged egg products and markets in different ways that can be legitimated by different values' (Parker, 2013, 67). It is therefore critically important for scholars, stakeholders, and publics to examine how risk is being framed, understood, experienced, and acted upon (Lupton 1999).

Efforts to reconcile the tensions between the three core domains of animal welfare – i.e. the Five Freedoms model, the Welfare Quality Project, the Five Domains welfare model, biochemical and haematological measures, and qualitative behaviour assessment – all face their own sets of challenges and limitations. This is particularly evident with respect to measurement reliability, operationalizing and implementing the framework, scaling the framework to meet the needs of large numbers of animals, ensuring transparency, and involving different groups of stakeholders (Thompson, 2015; Webster, 2016; Mellor, 2016; Wigham et al., 2018; Sandøe, 2019). Here, the use of weighted protocols (Yeates, 2013; Wigham et al., 2018) or precision/automated welfare assessments (Grethe, 2017; Winckler, 2019; Schillings, 2021) may help to prioritize certain welfare domains as opposed to others, but the establishment of such protocols and algorithms do not obviate the ethical dilemmas that are intrinsic to the prioritization choices. Animal welfare experts also disagree on which types of weighting procedures should be used for such models, and this is due at least in part to their basic differences in disciplinary training and professional roles (Dam Otten et al., 2017). There are also well-establish discrepancies between producers' and consumers' understanding of how animal welfare should be defined and pursued (Croney et al., 2018; Grethe, 2017). It should thus come as little surprise that 'no universally accepted measurement protocol has been devised' for animal welfare assessment (Wigham et

al., 2018, 176). Croney et al. (2019, 153) similarly conclude that 'it is likely impossible to find an engineering solution that fully addresses all of the issues'. The California ballot initiatives that changed farm animal welfare standards in 2008 (and then again in 2016) – along with the recently announced phase-out of caged systems in the European Union (Abnett, 2021) – demonstrate that 'the objective is a moving target… [and] to some extent, the long-term uncertainty is unavoidable' (Grethe, 2017, 85). Meanwhile, large meat companies and trade associations have continued to lobby for faster line speeds and fewer federal inspectors in processing facilities – practices that imperil both workers and animals (Nosowitz, 2020a, 2020b; Fu, 2020; Plume, 2021). Significant concerns thus remain with respect to producers' compliance with new animal welfare initiatives, both in the US (Reed, 2021) and in the EU (Dullaghan, 2020), and producer resistance to transparency only heightens public suspicion (Whitford, 2019).

Conclusion

In this paper, we have compared the different ways in which animal welfare risks are framed by industrial meat producers and their agrarian counterparts. We have also analysed concrete examples of how these paradigms are enacted by critiquing Grandin's animal welfare reforms and the practice of on-farm slaughter. Both industrial and agrarian producers have a concern for animal welfare, but they frame and define animal welfare very differently. The result is that different aspects of animal welfare are prioritized and protected and others not, depending on the system of production and the broader discursive framing. These frames shape and direct what both consumers and producers may accept as legitimate and safe.

While environmental and rural sociologists' ongoing search for viable alternatives to neoliberal capitalism and rampant industrialization is laudable and vitally important, our analysis shows that there are inevitable risks to animal welfare in both agrarian and industrial systems. We would thus encourage future environmental and rural sociological research on agricultural production to take these risks and contradictions more seriously. Moreover, given that the empirical scope of the present work is primarily focused on the US context, we would also welcome and encourage follow-up studies that focus more explicitly on the industrial vs agrarian paradigms of animal welfare outside of the US.

Regardless of where animals are raised or how well they might be treated, in order to produce meat, they must be killed. This reality can never be renegotiated, and while the killing of animals is widely accepted as a legitimate activity – made more palatable by the ways in which industrial and agrarian producers variously frame their animal welfare protection – periodic reminders of this killing continually disrupt that legitimacy.

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