The Effect of Farming Technology Innovations on Animal Cruelty

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

Farming has changed over the decades from the imagined large fields of cows and pigs, to a more industrialized, efficient structure. While it is considered more efficient, the technology can have controversial impacts on the treatment of the farm animals involved. Throughout this paper, I will reference "animal cruelty," which can be described in many different ways. For the sake of common understanding, I will use this phrase to refer to the unnecessary suffering of animals caused by humans. The reason for this definition is because a survey of 1,012 adults concluded that 93% of adults believe "that animal pain and suffering should be reduced as much as possible even though the animals are going to be slaughtered anyway" (Spira 1996). Technology used today that brings this into question is used in factory farming.

A factory farm is defined by the ASPCA (2019) as "an industrial facility that raises large numbers of farm animals such as pigs, chickens or cows in intensive confinement where their movements are extremely inhibited." This farming industry has a larger impact on us than we tend to expect. In fact, 99% of all farm animals are currently living on factory farms (Reese 2019), so when someone bites into a chicken sandwich, it makes sense for them to understand where that is coming from, and the ethics behind the making of that meal. Saulius Šimčikas (2019) has evidence showing that the number of vegetarians within the US has been on the rise since 2013, and that currently the population is somewhere between 2 and 6 percent vegetarian. I will investigate usable technology to end animal cruelty on factory farms while still preserving efficient meat production.

Case Context

First off, I will explain the basic technologies used in factory farms that are at least questionable in the way they are used with farm animals. I'll focus on practices used for chickens and pigs as they are most controversial. The most well-known of these is the gestation crate. A gestation crate is used to house adult female pigs, also known as sows. They are normally 2-2.5 feet wide, 7 feet long, and 3 feet tall. A diagram of how this relates to the size of an average farm pig can be seen in Figure 3. Sows will spend nearly their entire lives in a crate, unable to turn around, lay down, or even see their tail, though it gets cut off anyway. The tails are cut off in order to prevent other pigs in nearby crates from biting them off out of hunger and stress. In most of these farms, they stand on hard concrete with no natural lighting, with their legs giving out from underneath them, and their feces piling up at their feet. 95% of the pork consumed in the United States comes from pigs living in these conditions (Bardroff 2015).

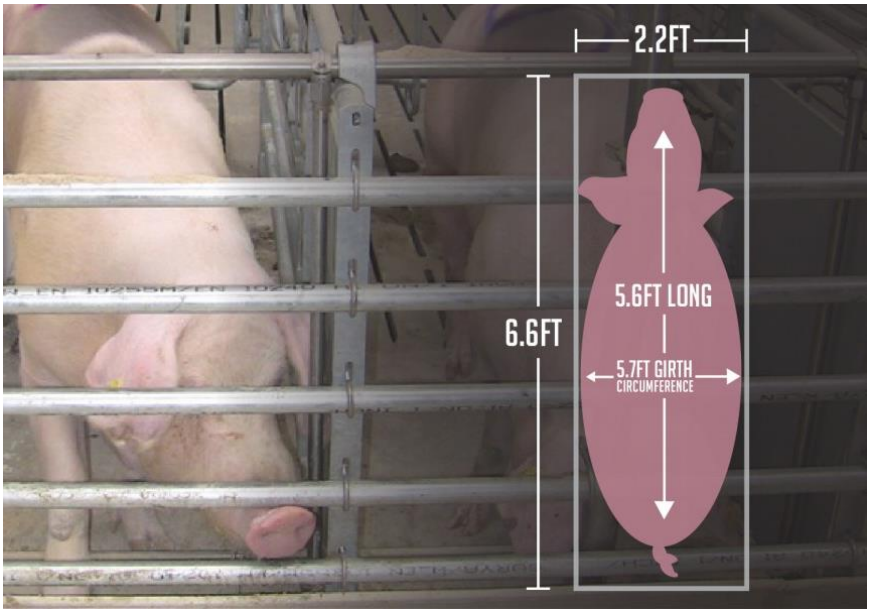

Figure 3. Diagram showing the size of a gestation crate in comparison to the size of the average sow housed there – nearly the same size as the crate itself. (Image Source: Bardroff 2015).

Moving onto chickens, the technology used for their treatment that I will pay attention to is battery cages. Battery cages are sized between 1 and 4 cubic feet, and are incredibly overcrowded, housing between 4 and 9 chickens. These are used to house the laying hens, whose sole purpose in the farm is to reproduce. These chickens are genetically modified to reproduce quicker and live longer, though the death rate is between 10 and 15 percent because of their living conditions (Frank 1979). Their beaks are removed early on to prevent them from killing and cannibalizing one another in these high-stress conditions. Living in cages stacked 8 high, the buildings can hold tens of thousands of these laying hens. The efficiency of this reproduction setup leads to chickens being the top slaughtered animal in the U.S., at over 700 million killed a month in comparison to pigs at around 10 million (The Ethical Implications of Factory Farming 2014). These living conditions are a clear difference from the farming style most people think of. The question that arises is whether or not this is considered unnecessary suffering to the public, which I plan to address in this research paper.

Factory Farming and Animal Cruelty

There are many ideas as to how we can move away from these ethical issues. For example, the introduction of meatless meats, like the impossible burger. Some people who go vegetarian because of animal welfare may still want the delicious taste of meat, and this is one of the only options they currently have to do that. Claire Robinson (2018) digs into the use of the impossible burger and how valuable it currently is. When it comes to environmental and health concerns, it is “at best questionable and at worst highly misleading.” Some of the evidence to support this is from the FDA, which ended up deciding they could not approve the safety of

eating the Impossible Burger, because of the unpredictable effect the unique proteins used in the burger could have on humans.

Evelyn Pluhar offers up another solution, known as in-vitro meat. Creating in-vitro meat is an incredibly complicated process, but to simplify it into a sentence, it involves taking an individual muscle cell from the animal, and then uses complex processes to replicate it and create actual meat from that animal. The demand for these food options is growing. In fact, "People for the Ethical Treatment of Animals (PETA) has offered $1 million to the first scientist who can produce affordable chicken nuggets that can pass a blind taste-test" (Pluhar 2009).

To better understand the issue, it is important to understand the different stakeholders and actors involved. Every consumer is a stakeholder, or at least those interested in animal products. The average consumer will need to make a choice between what level of care they think a farm animal deserves versus how much they are willing to pay for the products. Grocery stores, restaurants, and the farms themselves are all making more money than ever before due to the efficiency of these methods. The actors are the various technologies in these farms. For example, the gestation crates for pigs, battery cages for chickens, and the tools used to remove the tails from pigs and beaks from chickens. Lastly, the intangible actors could be anything from the idea of animal cruelty and what people consider to be cruel, to the current research into in-vitro meat and the idea of how we can create beef from a single muscle cell of a cow.

I plan to use Technological Determinism to analyze this system. Sally Wyatt (2008) describes this framework well and provides examples of it, such as the low-roofed bridges built between New York and Long Island that prevented the busing of poor individuals to the island. Essentially, Technological Determinism is analyzing how new technology can shape a society's future and values. This works against the analytical framework, Social Construction of

Technology, or SCOT. SCOT is used to analyze how a society controls future innovation so that it sticks to their values. In other words, the culture decides what technology to use, so that it supports what they believe, rather than letting innovation manipulate their values and beliefs as it would in Technological Determinism. The reason I want to use Technological Determinism for this topic is because from personal experience, when asking someone how the meat got onto their plate, they never want to hear the answer. Instead, usually they acknowledge that it likely isn't a good story, and then change the topic so that they can eat in peace. This is an example of how introducing this technology has caused people to be more content with worse animal treatment on farms. Knowing this from personal experience, I want to research it under a more structured approach and see how fair or unfair it is to make that claim.

This fits the topic well because as explained, there are many new technologies that were incorporated recently in these factory farms. A clear argument can be made that the invention of the gestation crate, with the prime purpose of housing pigs, has led to worse treatment of animals. Information on treatment like this has been widely available since the 90's, and yet meat consumption in the United States has hit an all-time high (Šimčikas 2019). It is a perfect example of how this technology being introduced has led to people being more complacent with poor animal treatment, or at the very least ignoring what is happening. This puts the blame on the invention of these technologies, rather than on the way that farmers use it to make the animals suffer over time. Along with this, we are seeing new ideas being brought to the forefront, like the in-vitro meat and the impossible burger, which could have a large impact on the social dimensions of farming technology in the near future.

Research Question and Methods

How have innovations in factory farming led to animal cruelty, and can we use technology to fix that? Meat consumption is higher than ever, yet the animal rights movement is gaining steam. It is a perfect example of engineering innovation in these farms leading to social controversy over the use of the technology. I created a survey and administered it in mass to students at UVa as well as using online forums on reddit. The age range of respondents spanned from 16 to 65, with around half of the total being college-aged. The google form included specific practices used in factory farming, and whether or not they think gestation crates, for example, are cruel to animals. It also had specific scenarios with options of how they'd respond, and asks targeted questions towards those that choose not to eat meat about why they've made that decision. This helps provide an understanding of the main reasons that people are increasingly going meatless, and how strongly they tend to stick to these identities. After gathering this information, thematic analysis can be used to understand what proportion of the general population consider gestation crates, for example, as a form of animal cruelty. Lastly, I interviewed a well-known Virginia farmer and the President of the Virginia Poultry Federation. Using Technological Determinism, I analyzed how people accept or reject practices used on their farms based off of the technology they have. These research methods of data collection and analysis, along with more research into the issue, result in a strong structure to provide potential solutions to the current examples of animal cruelty within the farming industry.

Results

After gathering and analyzing data on this subject, I've come to understand that the overwhelming majority of people seem to disagree with the practices used in factory farming,

but have a few reasons why they still eat meat produced in factory farms. In fact, of the 95 people that took my survey, 93% of them claimed to know about controversial practices used in factory farming, but just 20% of them said they followed any sort of restricted diet as it pertains to animal products. Breaking it down to those 20%, only 25% of them said that their main reason for restricting their diet was animal welfare. Instead, the majority of these vegans, vegetarians, and flexitarians said they did it mainly because of the environmental impacts that factory farming has caused. Going back to the 80% that don't have a restricted diet, 65% of them said that while they disagree with the poor animal treatment, they just don't like to think about it when they eat meat. Another 23% said that changing their individual diet won't have a large enough impact to change anything.

This evidence leads me to believe that the innovations in the farming industry being used have led people to feel more content with animal cruelty. While most disagree with the practices, few people attempt to do anything about it and continue to support it by their consumption of animal products on a normal basis. As I saw from my next survey question, one reason that people seem to not care is because they aren't constantly reminded of what is going on behind everything. Another question in the survey provides a restaurant scenario where before eating their meal, the waiter explains exactly how the animals were treated for the majority of their lives before slaughter. The waiter explains gestation crates and battery cages. When asked what they would do, nearly half of them said they would not eat that meal. Generally, it seems one prefers to forget about the animal cruelty in order to feel comfortable eating the meat on his or her plate, even if the way it got there may not be ethical.

After having my survey data, I set up an interview with Joel Salatin, an American Farmer at Polyface Farms, a farm that prides itself on developing "Environmentally, Economically, and

Emotionally Enhancing Agricultural Prototypes" (Polyface 2018) to then pass on to other farms. Salatin had a valuable perspective, and explained what techniques were the worst that are common amongst factory farms, the top of which was battery laying hens, as covered earlier in this paper. Seeing as he is known to promote healthy farming that is still efficient, I asked what practices they use that are unique. He gave me a huge list with most being too complicated for non-farmers to understand. Although, what can be seen in many of his videos online is the focus on natural practices. For example, he uses cows, pigs, and chickens to naturally support one another through fertilizing (cows), sanitation (laying hens), and aeration (pig aerators).

Another way they are able to save plenty of money is by avoiding the use of antibiotics. Most factory farms require large antibiotic use because of the easy spread of disease in the overcrowded buildings, but when treated healthily, this is never anything to worry about. Salatin's farm is a great example of how healthy farming can still be cost-effective, and he has plenty of videos online to explain that. My other interview was with Hobey Bauhan, the President of the Virginia Poultry Federation. The Virginia Poultry Federation (VPF) is a nonprofit trade association representing farmers, processors, and businesses within the poultry industry. When asked many of the same questions that Salatin was asked, it was interesting to hear his differing viewpoint. I asked Bauhan what he finds wrong with current factory farming practices, and he mainly argued that efficiency has grown because of these new innovations in the industry. In fact, he explained how it used to take 5 pounds of feed to produce a pound of chicken in the early 20th century, whereas now it only takes 2. He said "This efficiency is the result of scientific advances in breeding and nutrition." Lastly, he claimed that the environmental footprint they leave behind with these conventional farms is smaller.

When asked about in-vitro meat and meatless meats, Joel Salatin thought they couldn't end up taking a huge part of the meat industry because they "will go the way of hydrogenated vegetable oil, high fructose corn syrup and other manufactured ingredients that have fallen into disrepute over time." Salatin says diseases will be caused from eating these instead of natural meat. While his argument seems reasonable, it is important to note that it would certainly be in his best interest as with any farmer to argue against something that could potentially take from his business. Hobey Bauhan seemed to be more open to the idea saying that only time will tell, but it is certainly a possibility.

Lastly, when asked his overall opinion of farming in the United States, Bauhan said it was positive. He said "Science, technology, and the ingenuity and entrepreneurial spirit of American producers have resulted in the most productive and sustainable farmers in the world" while also claiming it is key for a growing world population. When Salatin was asked the same question, he responded "The problem is that in conventional industrial thinking, life is fundamentally mechanical; people like me believe life is fundamentally biological." He then went on to explain how if we think of it biologically and understand that the animals deserve a happy life, we can stay incredibly efficient and eliminate those practices. This is an important social issue that could cause even larger problems in the future. As he says in the movie, Food, Inc, "A culture that just views a pig as a pile of protoplasmic inanimate structure to be manipulated by whatever creative design the human can foist on that critter will probably view individuals within its community…with the same type of disdain and disrespect." (2009). The United States as a society will need to commit to a decision about whether or not animals are valuable and deserve reasonable treatment, and based off my survey and all other research, it seems like the majority of people believe that they are.

Discussion

In comparison to other survey results, it was surprising to see such a high percentage of people that had environmental concerns as their highest reasoning for changing diets away from animal products. For example, in a survey from 2018 with over 12,000 responses, 68.1% of people said animals was their primary reason for being vegan. This was taken from a much wider range of people, and had more respondents. One reason for this discrepancy is probably the larger focus on the environment in the last 2 years, so it would make sense for them to be more focused on that over animal welfare. As for the interviews, Joel Salatin seemed to agree with what my research was finding about what practices are bad in the farming industry. Hobey Bauhan offered a valuable perspective that I didn't find as much of from my other research, but also avoided talking about specific farming practices. He stuck to general terms, but since he is not a farmer himself, he may not know exactly what is going on at each farm that works with the Virginia Poultry Federation.

Based off of my survey results, factory farming seems to fit very well with Technological Determinism, as I expected from personal experience. Survey results showed that while many people disagree with the treatment of the animals, they push their values aside and eat the meat anyways. The basic theme I took from the survey was an "out of sight, out of mind" idea where consumers prefer not to think about the animal treatment and eat the food they enjoy. This makes sense because it shows how the introduction of technology like the gestation crate has changed our culture's values. Sticking with this framework, there are ways it could be used to better a society's values in the near future as well through something like the in-vitro meat. If consumers can have another convenient option to eat meat where they know the animals aren't being treated

poorly, we'd expect them to choose that over the other. We can expect this because of the survey results showing that the majority of them disagree with factory farming practices.

As for limitations, the major one was how hard it is to contact factory farms. After making many calls and sending plenty of emails, it was tough to get a response from farms that seemed to use the controversial practices mentioned. Another limitation was the timing of my research in relation to the seasons and the coronavirus pandemic. I was planning to do a visit of Joel Salatin's farm in early April, but it was unfortunately cancelled due to the risk of spreading the virus. However, Salatin was very quick to respond to emails and gave some additional details about farming practices they use which was helpful. Lastly, a minor limitation is the age distribution for my survey respondents. Seeing as it was easiest to get other college students to answer my survey, it resulted in about half of the respondents being students at UVa which could potentially skew the data. Therefore, it technically is a slightly inaccurate representation of the general U.S. population.

If there was more time to work on this, I would broaden my topic to include the impacts factory farming is having on the environment. This is another major issue that I did not cover because there is too much to fit into this paper. Plus, the results from my survey seemed to show that it is a hot topic. After seeing how enlightening an interview with a well-respected farmer was, I wish I had interviewed a few others. More specifically, I would get in touch with those who work on factory farms, because it would be unique to get their personal perspective on it. Do they agree with what they are doing, or are they just doing it for money? When looking online, it was complicated to find farms that would be open for visits, especially ones that seemed to be factory farms, but they don't advertise that of course. Gathering these different perspectives is what makes this research most unique.

Finishing up this research has given me a stable understanding of how my decisions in the future as an engineer are more important than I used to think. Being a computer science major, it is unlikely my work will overlap with animal welfare specifically, but there are clear social connections to what I will be doing, and it is important to keep those in mind. Being in a technical field, it is too common for engineers to get in a technical mindset and forget the social implications of their actions. My goal will be to remember my research and constantly remind others around me about how our work can have unintended consequences socially.

Conclusion

As Factory Farming is responsible for almost all of the meat we eat, it is astonishing to see how controversial it is. Meanwhile, for the sake of convenience, people who disagree with the practices will continue to eat meat. Some may argue that they are then supporting the animal cruelty, but others might say that changing one's personal diet won't have any impact. In summary, it is unrealistic to expect everyone to change their diets in order to boycott these practices, but there are a few ways these issues could be solved. One solution is to take a stand legally and work to pass legislation to outlaw specific parts of the process like gestation crates or overcrowding animals. Laws could go as far as to require check-ins on farms monthly to confirm the welfare of the animals. In fact, the Preventing Animal Cruelty and Torture Act was just passed in November of 2019 (Animal Welfare Institute 2019). While it isn't focused directly on Factory Farms, it shows that the animal rights movement is growing and working to fix issues of animal welfare constantly.

Another solution could come in the form of in-vitro meats or meatless meats, although farmers like Joel Salatin disagree with that approach. Understanding that people want to do what

is most convenient to them, if the meat industry was essentially taken over by these replacements, then there would be less of a need for the farms. Aside from Salatin's point on health effects, other issues here are affordability and efficiency. Impossible meats have already made it into restaurants around the country for reasonable prices, so maybe in-vitro meats can too. In 2013, the first lab-grown burger cost over $300,000 to make (Fountain 2013), but it has already become feasible to see it in supermarkets in the near future (Jacobsen 2017). Changes that require little effort on the consumer side are ones that seem the most realistic. Diet changes, while good and sometimes healthier, likely won't have an impact unless a massive movement could form. If engineers understood the social impacts that could come of their innovations, this all likely could have been avoided. Socially unaware engineers can simply be used as instruments to push efficiency while ignoring unfair practices. However, if they put more thought into what they work on, they can be critical pieces to prevent conflict and encourage efficiency in healthier ways. In the near future, I hope to see people stand up to the injustices within the meat industry, and understand the importance of sticking to our values as it pertains to animal welfare.

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