



The Future of Protein: Nourishing the World Sustainably

Policy and Information Package

BRIEF No.4

Ethics and Welfare in the Future of Protein

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Introduction

This brief discusses the theme of ‘**ethics and welfare**’ as it pertains to the future production and consumption of protein foods. The discussion surrounding the future of protein gives rise to ‘a perfect moral storm’ of competing values and interests. Globally, an estimated 70 billion land animals are killed for food each year.¹ Common practices in the industrial livestock sector have been shown to cause a great deal of animal pain and suffering.² At the same time, efforts to shift to ‘plant-based’ diets are also fraught with ethical debate, and a number of concerns have been raised about how novel proteins are produced and processed (inasmuch as their impacts on people’s health, the environment, and society). This brief tries to identify the core arguments made by various camps trying to make the agri-food system more ‘ethical’.

As noted in Brief No. 1 (Introduction), we make an important distinction between Animal-Sourced Protein Foods (**ASPFs**), Plant-Sourced Protein Foods (**PSPFs**), and Novel Proteins Food Products (**NPFs**) and further we track the discussion surrounding each theme as it is primarily tackled by three main pathways addressing the future of protein (see Brief No. 1 for further details):

- a) The **REPAIR** pathway aims to ‘fix’ existing problems relating to the protein agri-food subsystem, primarily through an approach prioritizing technological innovations and improvements.
- b) The **REPLACE** approach seeks a broader overhaul of the protein subsystem, prioritizing the replacement of ASPFs with PSPFs as the dominant protein source in the human diet, in addition to the introduction of new food commodities and consumption practices.
- c) The **RESTORE** ‘school’ aims to address the problem by ‘restoring’ a holistic balance between humans and nature within the protein subsystem. This includes an emphasis on maximizing biodiversity, biomimicry, natural resilience in the production process, as supported socio-economically through consumption practices.

In this brief, we tackle the following core questions:

- *What are the ethical concerns we need to consider in the future production and consumption of meat and its alternatives?*
- *How do the three pathways interpret ethics and welfare in the future of protein?*

A perfect moral storm

The discussion surrounding the future of protein gives rise to ‘a perfect moral storm’ of competing values and interests. As one might expect, in their quest to create a more ‘ethical’ agri-food protein subsector, the three pathways propose different solutions since they approach the topic from different vantage points and envision different trade-offs.



For those in the **repair camp**, values like **feeding a growing population** or **generating economic livelihoods for agricultural producers** serve as ethical priorities. Repair proponents typically see increasing **efficiency of industrial production of ASPFs as an ethical outcome**, not only because it best serves this goal of feeding the world, but also because, it is argued, technological innovations are poised to address concerns of animal welfare and environmental sustainability.



In contrast, the **replace pathway** is critical of the purposeful inclusion of domesticated animals in the agri-food system, seeing this as a fundamental ethical challenge. For some in the **replace camp**, **eliminating the pain and suffering of farm animals** should be prioritized, given their **moral status as sentient beings**. This camp therefore typically considers a **shift in both production and consumption from ASPFs to PSPFs as being the most ethical pathway** forward under a harm minimization framework. A shift in consumer behaviour towards ‘plant-based’ diets is more ethical, it is argued, since it reduces or entirely eliminates harm to animals, reduces the food system’s environmental footprint, and promotes public health and nutrition.



Finally, the **restore pathway** takes an approach that falls somewhere in the middle of the previous two. While proponents typically agree that livestock should remain a central aspect of the future production and consumption of protein, they **fundamentally disagree with the industrialization of production of both ASPFs and PSPFs, seeing in this system an ‘unethical’ approach to animals and nature**. This camp thus takes a more holistic approach that prioritizes the value of **biodiversity** and **environmental sustainability**, while still affording **respect to animals, farmers, and consumers**. In contrast to the replacement camp’s interpretation of harm minimization, those in the **restore camp** contend that **mixed production systems that work with nature are the least harmful**.

The Issue in Brief

What constitutes an ‘ethical’ or ‘unethical’ system of protein production and consumption differs based on the underlying philosophy. Some areas of ‘ethical’ concern in the protein subsystem (which in some cases compete with one another) include:

- The need to feed and nourish a growing human population;
- The need to protect agricultural workers and rural communities;
- The need to reduce the use of harmful chemicals or inputs from the food system;
- The need to provide sentient beings with rights;
- The need to treat domesticated sentient animals respectfully;
- The need to protect wildlife, natural habitats and ecosystems;
- The need to keep ‘unnatural’ and ‘unhealthy’ foods *out* of the food system

As such, the protein subsystem faces a number of complex challenges with respect to ethics and welfare:

- Globally, an estimated 70 billion land animals are killed for food each year, with 800 million of these deaths occurring in Canadian slaughterhouses.³ An overwhelming majority of these animals are raised in industrial livestock operations (ILOs), whose common practices have been shown to cause a great deal of animal pain and suffering.⁴
- Wildlife are often unwitting victims of human agricultural development. Due to the land use changes required for livestock production, animal agriculture is implicated as one of the leading drivers of habitat destruction and biodiversity loss.⁵ Conversely, industrial crop production decreases soil biodiversity and kills numerous field animals. One rough estimate puts the annual animal death toll of crop cultivation at 7.3 billion.⁶
- Food production is the single largest contributor to environmental degradation and pushing beyond our planetary boundaries (see Brief no.6).⁷ With respect to protein foods in particular, ASPFs are more resource intensive than their plant-based counterparts, with beef requiring eighteen times more land, ten times more water, and nine times more fuel than the equivalent amount of kidney beans.⁸ Furthermore, meat and dairy production are seen as significant contributors to global warming, and the livestock sector supply chain accounts for 14.5% of global emissions.⁹
- It is becoming increasingly difficult for independent food producers to compete without succumbing to consolidation, challenging their ability to earn a decent living.¹⁰ In the United States, for instance, just over half of farm production in 2015 came from farms with at least \$1 million in sales.¹¹
- Those employed in the production of both ASPFs and PSPFs (in North America) are often migrant workers who are paid minimum wage and have very few legal protections.¹² In the livestock industry, slaughterhouse work is associated with a number of disorders including

PTSD, and in the United States, abattoir workers are three times more likely than the average worker to suffer serious injuries.¹³

- The adoption of cell-cultured and plant-based meats challenge the economic livelihoods of traditional livestock farmers and may further diminish our relationship with nature.¹⁴ Their ‘unnaturalness’ (often produced in a laboratory setting using relatively new technologies in genetic engineering, considerable processing, etc.) raises concerns about whether these novel proteins should be included in human diets.
- As the demand for food increases in parallel to a growing population, the challenge of achieving global food security is becoming more difficult. In 2018, an estimated 821 million people were considered undernourished¹⁵ and it is anticipated that the impacts of climate change, particularly on agricultural productivity, will make the situation more dire.¹⁶
- For many different groups of people, certain foods have cultural and social significance. Transforming the food system and shifting consumer diets through policy measures may therefore disrupt longstanding traditions and subsequently result in public condemnation.

In short, the present agri-food system (as mirrored in the protein subsystem) incurs a tremendous toll **of harm on animals, people, and the planet**. A singular ‘ethical’ agri-food protein subsector does not exist – there are too many competing values, and cultural and geographical differences shape different conceptions of what constitutes an ethical choice. However, there may just be enough common or shared value when it comes to questions about **harm minimization to serve as a framework for good policy**. That is, for each pathway in the future of protein, we can ask to what extent steps are being taken to ensure that harm is not being incurred – by animals, people, or the planet. All pathways largely agree that the policies informing the future production and consumption of ASPFs and PSPFs ought to promote the well-being of all three – this means **a food system that supports good nutrition, public health and social justice; treats sentient beings with respect; and supports planetary health and the integrity of ecosystems**.

There thus arises an ethical challenge for all camps in the future of protein debate:

For modernists in both the **repair** and **replace camps**, the challenge is to **prove that ‘efficient’ mass-production of protein (ASPFs, PSPFs and NSPFs) can occur in a way that does NOT cause harm to animals (both domesticated and wild), humans, or to the broader environment**. Those in the **replace** school face additional scrutiny about the ‘ethics’ involved in genetic modification (for synthetically produced meat tissues) as well as the ethics of enforced dietary change given strong cultural importance of certain foods. Meanwhile, those in the **restore** camp face an ethical critique in the form of cost and scale – **if the ‘ethical’ production of both ASPFs and PSPFs requires more resources and costs *per unit of output*, then does this not present an ethical dilemma in a world plagued by food insecurity challenges?**

Background

a) Animal Welfare Expenses of Agricultural Industrialization

The agri-food system is becoming increasingly industrialized. In North America, for instance, the number of farms is decreasing overall, while the size of farms is becoming larger.¹⁷ Although at a slower pace, this trend has also been observed in both Europe and Asia.¹⁸ For some, the industrialization trend is considered to be overall beneficial because of the efficiencies it fosters. However, many criticisms have been raised about the way animals are raised in industrialized systems. Intensive livestock operations (ILOs), or factory farms, employ practices that inflict a great deal of pain and suffering on domesticated farm animals. For instance, high stocking densities require tight confinement and cramming. Notable examples include the use of crates for veal calves, battery cages for laying hens, and gestation stalls for sows. All of these severely restrict animals' ability to move and prevent them from engaging in natural behaviour. Other animal welfare expenses include mutilation through practices such as hot iron branding, castration, tail docking, and beak trimming; health complications due to genetic selection and poor housing; and inhumane transportation and slaughter.¹⁹

Given that ILOs raise and kill more than 50 billion land animals annually globally,²⁰ animal cruelty is an important ethical concern for the future production of protein foods. For some, this cruelty should be considered morally impermissible given the sentience of farm animals – not unlike that which we recognize in domesticated cats and dogs.²¹ On the other hand, if the inclusion of animals in the agri-food system is deemed to be ethical, a number of questions must be addressed: **What amount of pain and suffering is justifiable? Which philosophical view of non-human interests should guide farm animal welfare standards? Are the current 'Five Freedoms' adequate, and if so, are they being adhered to uniformly?**

b) Environmental Sustainability and Contributions to Climate Change

A second ethical challenge facing the agri-food system and livestock production in particular is environmental sustainability [for a more detailed discussion see Brief No. 6: Climate Change and Biodiversity]. The livestock sector accounts for 70 percent of all agricultural land use, uses a significant amount of freshwater resources, and contributes an estimated 14.5 percent of anthropogenic GHG emissions.²² Despite considerable improvements in efficiency, absolute emissions of the sector continue to grow in parallel to increasing demand for ASPFs in particular.²³ Conversely, industrial crop production is not without environmental consequence. Monocropping, tilling, and the use of herbicides and pesticides have all been shown to dramatically impact biodiversity, wildlife, soil degradation, and carbon emissions.²⁴ **How do we balance the moral obligation to mitigate climate change and restore planetary health with the food security challenge posed by a growing population?**

An extension of the environmental challenge is the impact concentrated animal feeding operations (CAFOs) have on the rural communities in which they are situated. When animals are housed in high densities, storing and disposing of manure becomes challenging as the amount of waste typically outweighs that which can be absorbed by surrounding fields. Excess waste and nutrients often end up in the local watershed, degrading both ground and surface water quality.²⁵ Improper management of manure reduces local air quality, leading to adverse health effects for those living nearby. The concentration of CAFOs in poor minority communities presents questions of fairness and justice, as their disproportionate exposure to health effects can be characterized as a form of environmental racism.²⁶

c) *Farmer Livelihoods and Working Conditions*

Coinciding with the growth in average farm size has been the incorporation of farmland. In both Canada and the United States, technology and agricultural policies have pressured farmers to “get big or get out”. The challenge of competing with industrial farms has put many small and medium sized farms out of business, leading to farmland ownership being concentrated amongst a few large corporations.²⁷ In the United States, for instance, just over half of farm production in 2015 came from farms with at least \$1 million in sales.²⁸ As the cost of farmland has steadily risen,²⁹ **it has become increasingly difficult for small farmers to earn a decent living and maintain control over their farms.**³⁰ Consequentially, farmer debt continues to increase, doubling in Canada over the last two decades.³¹ This has forced farmers to supplement their income through off-farm employment.³²

A related concern is the difficult and dangerous working conditions faced by those employed in the livestock sector. Slaughterhouse work has been linked to a number of disorders, including post-traumatic stress disorder and perpetration-induced traumatic stress, as well as higher incidents of domestic abuse, and alcohol and drug abuse.³³ The industry is also relatively dangerous, with meat workers being three times more likely to suffer serious injuries than the average American worker.³⁴ As is the case throughout the North American agri-food sector, the individuals performing this demanding work are often migrant workers, most of whom are paid minimum wage and have few legal protections.³⁵

d) *Alternative Proteins and Meat Substitutes*

In recent years, there has been a shift towards the development of alternative proteins such as plant-based and cell-cultured meats. Technological innovation has made it possible to mimic the taste and texture of animal flesh using plants, enticing consumers to **replace** their conventional meat with plant-based alternatives. At the same time, companies like Memphis Meats have successfully produced animal tissue using cell-culture technology instead of live animals.³⁶

While those approaching from an animal ethics framework tend to be supportive of their adoption given the animal welfare and claimed environmental benefits, some ethical critiques have been raised about alternative proteins.³⁷ For one, plant-based and cell-cultured meat analogues are often characterized as being ‘artificial’ or ‘unnatural’.³⁸ Similar to the cautionary narrative surrounding genetically modified organisms (GMOs) more broadly, this critique is rooted in the idea that human intervention in the natural order is wrong and does more harm than good. Studies suggest the perceived ‘unnaturalness’ of cell-cultured meat will likely result in reluctance by consumers.³⁹ **In a world where people are already so far disconnected from the food on their plate, the moral question of whether alternative proteins move us further away from our connection with nature is important to consider.** Relatedly, a second concern is that plant-based meats are typically highly-processed. Despite their appearance as healthier alternatives, in large part due to the use of ‘vegan’ and ‘plant-based’ labels, research suggests their consumption may pose significant health risks.⁴⁰

Lastly, concerns have been raised about the impact alternative proteins have on the economic livelihoods of farmers. The replacement of conventional livestock with PSPFs and cultured meat will certainly lead to a reduction in livestock production, putting many farmers out of business. For instance, the survival of dairy farming communities has been challenged by recent growth in the demand for plant-based milk.⁴¹ Additionally, meat substitutes may further promote the concentration of production amongst a few corporations. The current cost of producing lab-grown meat limits development and investment opportunities to wealthy investors and corporations, while gene-patenting and intellectual property rights limit competitiveness in the marketplace.

e) Food Security and Affordability

Despite the efficiencies of industrial agriculture, the reality of the current food system is that millions of people remain food insecure [for further discussion see Brief No. 2: Feeding the World]. According to the Food and Agriculture Organization (FAO) of the United Nations, the number of undernourished people globally has grown over the last few years, reaching an estimated 821 million people in 2018, or one in every nine people.⁴² Even in developed countries such as Canada, affordability and accessibility barriers limit peoples’ ability to purchase healthy, sustainable, and ethically sourced foods.⁴³ To make matters worse, the impacts of climate change are expected to negatively affect crop yields, increase the number of food shortages, and increase food prices.⁴⁴ This will exacerbate food insecurity and further limit consumer autonomy. **How can we ensure people have access to affordable, healthy, and sustainable sources of protein foods, while at the same time minimizing natural resource dependency and animal cruelty?**

f) Cultural and Social Significance of Food

For many people, meat consumption is a source of pleasure that is tied to both social gatherings and cultural traditions. While strategies that aim to shift consumption towards PSPFs may address some of the ethical concerns raised above, **the cultural and social significance of meat introduces the ethical dilemma of whether it is morally permissible to instruct people on what foods they should consume.**⁴⁵ In thinking about effective policies for behavioural change and the crafting of a more ethical protein subsystem, it is important to consider public acceptability of government intervention. Efforts to influence consumer food choices may be met with harsh criticism from those who already struggle to access and afford the foods they prefer [See Brief No.5: Culinary Change].

Considerations

Reaching an ethical consensus amongst the three pathways is not realistic given the unavoidable tradeoffs between moral values. For each pathway in the future of protein, we can ask to what extent steps are being taken to ensure that **harm is not being incurred – by animals, people, or the planet.** This section will provide an overview of each pathway’s ethical priorities, their philosophical views on the use of farm animals, and their interpretation of harm minimization.

We begin by reporting the international standard for farm animal welfare that is mostly agreed upon in animal agriculture, known as the Five Freedoms. In assessing the magnitude of change each pathway envisions for animal welfare, this standard should be considered.

Farm Animal Five Freedoms⁴⁶

1. Freedom from hunger or thirst

by ready access to fresh water and a diet to maintain full health and vigour

2. Freedom from discomfort

by providing an appropriate environment including shelter and a comfortable resting area

3. Freedom from pain, injury or disease

by prevention or rapid diagnosis and treatment

4. Freedom to express (most) normal behaviour

by providing sufficient space, proper facilities and company of the animal's own kind

5. Freedom from fear and distress

by ensuring conditions and treatment which avoid mental suffering

‘REPAIR’ pathway considerations

Ethical Priorities

For the **repair** pathway’s vision of an ethical protein subsystem, feeding the world’s growing population and generating economic livelihoods for food producers serve as ethical priorities. In addition to addressing these moral challenges, increasing productivity through technological innovation also reduces the environmental impacts of food production and improves the health of farm animals. As a result, proponents of this approach see the efficient industrial production of ASPFs as ethically justifiable.

Philosophical Views on Eating Animals

The exploitation and killing of animals in industrial livestock production are justified in various ways. Some proponents make the evolutionary argument that humans have evolved to eat meat, while others rely on human exceptionalism – the belief that humans are morally superior to other animals. Adhering to the latter, Hsiao claims that the suffering of farm animals is not cruel or immoral since non-human animals lack the capacity to reason required for moral status.⁴⁷ Grandin also considers it morally permissible to kill animals for food, similarly offering species membership as a justification.⁴⁸ Budiansky takes a slightly different approach, characterizing the relationship between humans and domesticated farm animals as a moral contract that benefits both parties.⁴⁹

Interpretation of Harm Minimization

Achieving Global Food Security and Promoting Economic Livelihoods

With an increasing global population that will reach 9.6 billion people by 2050, and rising affluence in the developing world, demand for ASPFs is expected to increase by as much as 70 percent.⁵⁰ For those in the **repair** pathway, meeting this demand is only possible through livestock intensification. By increasing productivity, a greater quantity of ASPFs becomes available for those who need them to maintain health. This is in stark contrast to less productive pasture-based systems.

There are three primary methods for increasing animal productivity: optimizing feed, using selective breeds, and improving animal health.⁵¹ By using crop-based feeds, the amount of feed produced per area of land increases and the nutritional quality and digestibility of feed is improved. Secondly, selective breeding through artificial insemination and genetics allow producers to target genes that are favourable. Lastly, maintaining animal health and welfare (i.e. providing shelter) has been shown to improve yields. In addition to these strategies, higher stocking densities and mechanization improve production efficiency at the farm level. For instance, automatic milking systems allow farmers to milk multiple cows at once.⁵² On the crop production side, technological improvements have reduced resource requirements and allowed producers to process grain at a much faster rate than in the past.⁵³

More with Less – Improving Resource Efficiency and Emissions Intensity

For the **repair** pathway, growing population and demand for ASPFs are non-negotiable realities of the future. In minimizing environmental harm, it is essential that we are able to increase, or at the very least maintain current levels of animal protein production without expanding agricultural land. By improving efficiency on the farm, more meat and dairy can be produced with fewer natural resources. Over the last few decades, ruminant meat and milk production have grown significantly despite a steady decline in global pasture area.⁵⁴

For climate change mitigation, the **repair** pathway focuses on reducing GHG emissions intensity – or the amount of emissions produced per unit of food. In addition to the reductions provided by simply improving efficiency [see above], the industry has also found innovative ways to decrease ruminant methane. For example, early research suggests that feeding cattle various supplements (like seaweed, algae, etc.) may significantly reduce the amount of methane they belch.⁵⁵ In addition to diet manipulation, anaerobic digesters allow producers to capture methane contained in ruminant manure, which can then be recycled as a form of energy.⁵⁶

The **repair** pathway is critical of the environmental benefits promised by the **restore** pathway. For one, grazing systems require far more land to produce the same amount of food than their industrial counterparts, bringing into question the scalability of the **restore** model. Additionally, some research has found the amount of methane produced by grass-fed cattle to be *higher* than that produced by grain-fed cattle, and that these emissions outweigh those offset through carbon sequestration.⁵⁷ Lastly, soil carbon sequestration is limited by finite carbon sink capacity and uncertainty in how these lands will be managed in the future.

Minimizing Animal Pain and Suffering through Technology and Science

The key challenge of the **repair** pathway is realizing gains in productivity and efficiency without sacrificing animal welfare. Despite this challenge, the intersection between productivity and animal health means that producers share an interest in improving animal welfare. For instance, optimizing feed not only increases livestock productivity, but also improves their nutrition. At the same time, improved productivity results in fewer animals needing to be raised.

Advancements in science have also led to improvements in animal well-being and a reduction in the pain they experience. Selective breeding and gene editing decrease the presence of traits that contribute to poor animal welfare (i.e. selecting against feather pecking in laying hens, breeding cattle without horns that would otherwise be removed painfully, and in-ovo sexing that eliminates the slaughter of male chicks in the egg industry). Precision management allows for real-time monitoring of animal health and housing conditions, ensuring that any discomfort is addressed immediately.⁵⁸ Informed by animal behaviour research, Grandin's humane slaughter model is another strategy for minimizing pain. One key feature is curved handling chutes between holding pens and the point of slaughter, which eliminates or reduces the animals' stress and chances of being startled.⁵⁹ Additionally, the model emphasizes the proper use of bolt stunners to ensure animal unconsciousness when they are killed.

'REPLACE' pathway considerations

Ethical Priorities

The **replace** pathway disagrees with the notion that the inclusion of animals in the agri-food system is 'ethical'. Given their moral status as sentient beings, eliminating the pain and suffering of farm animals should be prioritized. This camp therefore considers a shift in both production and consumption from ASPFs to PSPFs as being the most ethical pathway forward under a harm minimization framework. Shifting consumer behaviour away from meat and dairy and towards plant-based proteins reduces or eliminates entirely harm to animals, reduces the food system's environmental footprint, and promotes public health and nutrition.

Philosophical Views on Eating Animals

For those in this camp, the inclusion of animals in the agri-food system is considered morally impermissible, based upon animal rights discourse that recognizes the sentience of animals. Within this discourse, there are a number of arguments for why killing animals for food is considered wrong. Utilitarian theorist Jeremy Bentham famously wrote in 1789 when discussing moral status inclusion, that "the question is not can they reason? nor, can they talk? but, can they suffer?".⁶⁰ Peter Singer suggests that the sentience of animals leads to their possession of interests that go beyond avoiding pain and suffering. He argues that all beings with interests, irrespective of what species they belong to, deserve to have those interests taken into account in our moral decision making.⁶¹ Deontological arguments range in the degree of rights they afford, but Tom Regan famously argues that it is wrong to kill animals on the basis that doing so violates their rights to life.⁶² Lastly, virtue-oriented theorists consider the use of animals for food as being self-indulgent and unjust.⁶³

If we appreciate that non-humans are sentient beings with interests beyond pain avoidance, then the belief of human exceptionalism on which the **repair** pathway is typically built is critically flawed. Animal rights proponents have coined their own term for this – **speciesism**, which refer to the discriminatory treatment of one's welfare or interests solely based on their species membership, and contesting the distinction between human and non-human animals. Cows have been shown to be far more sophisticated and sensitive than perceived by most people,⁶⁴ and pigs have been shown to have complex ethological traits that are similar to dogs and chimpanzees.⁶⁵ Those in the Replace camp thus ask: Is it ethical to draw a line between animals seen as deserving personhood and those we see as more as features of a landscape or source of food? Why do infants and intellectually disabled humans have moral status and animals do not?⁶⁶

Interpretation of Harm Minimization

Ethical Veganism and Eliminating the Suffering of Farm Animals

Those in the **replace** pathway *typically* consider the replacement of ASPFs with PSPFs to be the least harmful to animals because **it reduces or eliminates their pain and suffering**. There are a variety of approaches that fall within this pathway, spanning the broad animal rights spectrum discussed above. Some promoters take no issue with raising animals so long as they are not killed (i.e. ovo-lacto vegetarians), while others see animal exploitation in any fashion as morally unjustifiable. Likewise, support for lab-grown meat and insect protein is not unanimous within the replace camp. The former still requires animals and maintains a view of them as being edible,⁶⁷ while the latter debate hinges on the scientific uncertainty of insects' pain reception. New research suggests that non-animal species display sensory capacities and possess what Singer would call 'interests'.⁶⁸

Despite these points of contention, supporters agree that both PSPFs and NFPFs are less harmful to animals than the conventional meat alternative. As such, the leading view that has emerged is that of ethical vegetarianism (or veganism). Based upon cruelty objections to factory farming, the basic argument as outlined by Rachels⁶⁹, goes as followed:

1. It is wrong to cause pain without a morally good reason;
2. In the modern meat-production business, animals are made to suffer terribly;
3. Given that readily available alternatives exist, we can nourish ourselves without consuming animals;
4. Therefore, nutrition is not a morally good reason to cause pain to animals;
5. Therefore, industrial farming, which causes pain to animals, is wrong;
6. Therefore, we should stop eating the products of this business and be vegetarians (or vegans) instead.

For the **replace** pathway, alternative strategies for improving animal welfare through reduction and refinement are imperfect. As they see it, the overwhelming majority of meat production is cruel to animals, and so consuming animal products therefore contributes to this cruelty, irrespective of the existence of less cruel forms of meat production.⁷⁰ Animal rights philosophers would further argue that despite allowing farm animals to live more naturally, the **restore** pathway's inclusion of animals in the agri-food system is unethical, and continuance of their slaughter ensures that animals are still harmed a great deal.

A number of issues with addressing animal welfare through science and technology have been raised by those in the **replace** camp. For one, a focus on pain minimization fails to engage the moral status of animals as sentient beings.⁷¹ Even if those in the replace pathway concede that pain and suffering is an appropriate measuring stick for animal welfare, a second issue is that cruelty and suffering are inevitable aspects of industrial livestock production. Even if all US slaughter plants met Temple Grandin's 'humane' standards, close to 200 million animals would be

inhumanely killed each year. Further, Grandin’s model does not address cruelty that occurs before an animal ever reaches the slaughterhouse (i.e. castration, branding, animal fighting, intensive confinement, etc.).⁷²

Reducing GHG Emissions and the Environmental Footprint of Agriculture

Arguably, environmental degradation and climate change is the quintessential ethical issue we face. If global warming remains unaddressed, the planet will become unlivable for future generations, rendering the moral status of the food system irrelevant. Despite improvements in efficiency, absolute emissions of the livestock sector continue to grow.⁷³ At the same time, livestock production occupies and consumes an overwhelming amount of arable land and freshwater resources [see Brief No. 6: Climate Change and Biodiversity for more detail]. Those in the **replace** camp contend that the adoption of plant-based or lesser meat diets is essential for mitigating climate change and limiting natural resource depletion.⁷⁴ Vegetal protein sources are much less resource intensive and produce far fewer emissions than their conventional meat counterparts.⁷⁵ While still in their infancy, cell-cultured meats and insect protein have also been shown to have environmental footprints that are significantly lower than conventional meat.⁷⁶

Improving Public Health and Nutrition

In promoting the well-being of people, the **replace** pathway prioritizes the public health and nutritional benefits of replacing ASPFs in favour of PSPFs and other novel proteins [see Brief No. 3: Nutrition and Health for further detail]. A number of studies have shown that consumption of red meat and particularly of processed meat is associated with higher mortality rates, cardiovascular disease, colorectal cancer, and type 2 diabetes.⁷⁷ Conversely, reducing meat consumption has been associated with positive health outcomes.⁷⁸ The replacement of ASPFs is also seen as an opportunity for small-scale farmers to transition into the plant-based protein economy,⁷⁹ which is seeing unprecedented growth in recent years [see Brief No. 5: Culinary Change]. Large agriculture companies have disproportionately benefitted from the growth in demand for meat and dairy production, lending to the need for an overhaul of the system.

‘RESTORE’ pathway considerations

Ethical Priorities

Given that the death of species (plants, animals, insects, and cellular organisms) at the hands of another is an inescapable part of nature, the **restore** pathway agrees that livestock should remain a central aspect of the future production and consumption of protein. However, they fundamentally disagree with the industrialization of production. Industrial forms of production promoted by the **repair** pathway are ‘unethical’ because they de-naturalize the cycle of death and rebirth and are inhumane in their treatment of animals, both domesticated and wild. In contrast, promoters of the restore pathway aim to restore a holistic balance between humans and nature, whereby death occurs as naturally as possible and is followed by rebirth and regeneration. Although

environmental sustainability and biodiversity are prioritized, the pathway still affords a great deal of respect to the welfare of animals and the success of small-scale farmers.

Philosophical Views on Killing and Eating Animals

From a philosophical perspective, the **restore** pathway considers the inclusion of animals in the agri-food system to be ethical. This moral permissibility is conditional on animals being treated well, fed an appropriate diet, and given the opportunity to express their natural behaviours. The **restore** pathway considers the current practices of industrial animal agriculture to be unethical, agreeing with the **replace** pathway's characterization of these methods as cruel and inhumane. The historical record of ruminants grazing and providing critical ecosystem services – a process which was immutably entwined with the lives of predator species which preyed upon ruminants – is an example of what the **restore** pathway seeks to replicate. By using rotational grazing methods or other pasture-based systems, farm animals are able to pursue their own interests “as nature intended”, and wild species of animals and insects are able to thrive. This definition of animal welfare falls in the middle of the alternatives – neither condoning the tight confinement or suffering of animals, nor going as far as extending rights to animals that would deem their exploitation morally unjustifiable.

Interpretation of Harm Minimization

Restoring Nature and Mitigating Climate Change through Holistic Land Management

For the **restore** pathway, achieving environmental sustainability requires production methods that work with nature rather than against it. Holistic land management strategies allow ruminants to perform critical ecological services as nature intended and have the potential to restore the balance of ecosystems, increase biodiversity, enrich soils, and mitigate global warming. An essential aspect of this approach to sustainability is ‘**restoring**’ the health of our soils for carbon sequestration. As the largest terrestrial carbon sink, soils hold two to three times as much carbon as the atmosphere. Through holistic farming practices such as regenerative agriculture and planned grazing, carbon can be pulled from the atmosphere and sequestered in soils previously decimated by industrial crop production. A number of other ecosystem services would be provided, including water filtration and flood/drought regulation⁸⁰ [discussed in more detail in Brief No.6: Climate Change and Biodiversity].

Consuming Large Herbivores is the Least Harmful to Animals

In compliance with the Least Harm Principle, we must choose the method of food production that causes the least harm to animals. While the **restore** pathway agrees that industrial animal agriculture results in unnecessary harm to animals that is morally impermissible, they disagree with the **replace** pathway's suggestion that we are morally obliged to consume a vegan or vegetarian diet. The veganism argument assumes that consuming vegetables is the only alternative to factory farming, failing to appreciate that less harmful systems of meat production exist.⁸¹

In order to produce plant-based foods for human consumption, a large number of field animals are killed in the process. Davis estimates that 1.8 billion animals would be killed annually to produce a vegan diet for the United States.⁸² Are the deaths of field animals not morally relevant? Irrespective of whether these deaths are intentional, they constitute harm incurred by animals nonetheless. Vegan diets are therefore not bloodless. Alternatively, pasture forage production, which allow ruminants like cattle to harvest the forage, requires far less tilling and use of farm equipment. As a result, Davis estimates that a 50/50 split of plant and forage production would kill fewer animals (1.4 billion) than the vegan alternative. Other forms of meat production, including collecting roadkill and hunting and trapping animals would similarly result in far less harm than the factory farming alternative. Participating in these forms of meat production would also comply with the ethical vegetarianism's claim that we must not support factory farming.⁸³

Another criticism of the replace pathway's approach is its reliance on speciesism for moral argument. Given that new evidence shows that non-animal species have sensory capacities and what Peter Singer might characterize as 'interests', why are their deaths (and consumption) morally permissible, but not animals'? Why should we stop at domesticated farm animals in the awarding of moral status ?

Returning Consumers to the Source of their Food and Enabling Small-Scale Farmers

The **restore** pathway's integration of animal and crop production enable the economic, environmental, and social success of local regions in the developing world. They further support small-scale farmers in the developed world who have economically struggled in the face of industrialization, returning people closer to the source of their dinner. While the **repair** pathway claims an ethical priority of promoting the well-being of farmers, those in the restore camp argue that the former fails to acknowledge how large agriculture corporations remain the disproportionate benefactor of intensification. The **replace** pathway's vision for cell-cultured meats is also troublesome for small farmers. Due to the high costs of development for lab-grown meat and the market implications of gene-patenting, such a shift would similarly allow large corporations to flourish at the expense of small farmers. Unless we return to systems of pasture-based production, small and medium size farms will continue to be decimated by corporate farming. Additionally, spreading the wealth of knowledge on regenerative agriculture and holistic land management will allow farmers in the developing world to build resilience against the impacts of climate change, invaluable for ensuring global food security.

While developed countries are plagued by chronic disease in part because of overconsumption of processed meats, eating meat in moderation provides essential nutrients that are otherwise difficult to obtain for a large segment of the global population. For thousands of years, our ancestors have consumed omnivore diets. With this, meat and dairy consumption have also become intertwined with social gatherings and cultural traditions. Continuing the inclusion of livestock in the food system allows these cultural and social dynamics to survive.

Conclusions

Despite their competing ontologies, all pathways seem to agree that any agri-food system that includes livestock requires that pain and suffering be minimized and legal protections be optimized. Both the **restore** and **replace** pathways would agree that in most countries, animal cruelty laws are *inadequate* in preventing the harms of ILOs. This is certainly the case in Canada and the United States where federal anti-cruelty legislation defines farm animals as private property. Application tends to focus on unnecessary pain of animals, thereby creating a loophole for farming practices.⁸⁴ Provincial and state legislation similarly exempt normal farming practices, and there is a lack of consistency across provinces and states. What can be agreed upon is the need for coherent national systems of animal welfare standards and legal provisions in order to ensure uniformity.⁸⁵ The European Union has been much more active on animal welfare legislation, providing a possible blueprint for countries like Canada and the United States.⁸⁶

The key challenge is defining animal welfare in a way that all pathways can come to terms with, for instance:

- **REPAIR** – Developing clear guidelines for producers about what conditions provide not just ‘adequate’, but ‘ideal’ animal welfare (i.e. size of battery cages, time spent outdoors, etc.) may be a preferred approach to improving welfare legislation.
- **REPLACE** – Gradual improvements in legal protections informed by animal behaviour science are seen as a starting-point, with the eventual goal of recognizing that nonhuman animals have rights. This may, in theory, result in the elimination of the inclusion of animals in the agri-food system.
- **RESTORE** – Developing clear guidelines that allow animals to live more fulfilling biologically-appropriate lives. Examples include requiring that livestock have access to grass, a minimum amount of outdoor space per animal, etc. Changes to legislation governing the abattoir sector would be welcomed in order to eliminate the required transport of livestock for slaughter.

In addition to improving animal welfare through the harmonization of animal welfare legislation, other recommendations include implementing an independent enforcement agency for oversight and increasing transparency in livestock facilities. An independent body that is federally funded will have the capacity to investigate claims of animal cruelty and conduct unscheduled audits. Eliminating ag-gag laws that punish whistleblowers and adding CCTV in slaughterhouses would increase transparency for consumers and incentivize producers to clean up their act.

Improving Accessibility to and Affordability of Sustainable, Ethical, and Healthy Foods

To eat the way the **restore** pathway recommends, animal proteins typically become much more costly. This stems from the externalities of food production (i.e. environmental degradation, welfare, etc.). By not being accounted for in the cost of production, industrial production is given “a free pass” to degrade the planet’s health and impose pain and suffering on sentient beings.

Conversely, farmers who employ sustainable or ethical practices are not rewarded for their efforts. This advantage for industrial models of production is furthered by agricultural subsidies, which in an effort to grow agri-food exports, have promoted grain-fed models of livestock production and monoculture farming.

It is arguably important to financially support farmers who employ sustainable and ethical practices (i.e. rotational grazing methods, regenerative agriculture, higher animal welfare standards, etc.). Although a shift in agricultural subsidies that typically reward industrial models of production is one option, an alternative that policymakers may be more amenable to is allocating a portion of government support without disrupting existing subsidies.⁸⁷ Complementary policy solutions include funding for research and development in novel proteins, supporting regenerative agriculture through carbon sequestration credits, job transitioning programs for those employed in industrial livestock, and shifting public procurement towards greener meat and PSPFs.

On the consumer side, those who can afford to should support ethical and sustainable farming practices. As Michael Pollan suggests, we should vote with our forks. For those who cannot, it is important that policies be in place to support these individuals. Enabling low-income individuals is necessary if they are to make informed eating decisions. Potential policies include the use of refundable tax credits for low-income households, food credits that can only be used for certain categories of food, or a universal basic income. Given that cost is not the only barrier faced by these communities, improving accessibility to plant-based meat alternatives and produce/meat that is grown or raised in regenerative systems of agriculture is also essential.

Closing the Knowledge Gap and Encouraging Behavioural Change

Consumers drive producers' willingness to change their practices and research suggests they are willing to pay for higher welfare standards.⁸⁸ However, consumers currently lack an understanding of where their food originates from and the ethical tradeoffs their choices have. In order to fully realize consumer autonomy, it is essential that accurate information is communicated. Through its evidence-based revision of the national food guide, Canada has taken meaningful steps in this direction. As part of the first-ever Food Policy for Canada, an education campaign that highlights the food-climate relationship and other ethical concerns of food production would improve food literacy and change consumer habits. Furthermore, the use of welfare-based quality assurance schemes and carbon labels would improve consumer awareness and autonomy in the supermarket.⁸⁹ Both the **replace** and **restore** pathways would be supportive of this recommendation.

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