

CLEAN MEAT POLICY CAMPAIGN

EXECUTIVE SUMMARY

Health and disease prevention

From a health perspective, clean meat demonstrates a distinct advantage over conventionally grown meat regarding both foodborne illness and antibiotic resistance. Industrial animal agriculture is often criticized for its poor design of space that contributes to disease prevalence in human and non-human animals. In addition, consistent human consumption of animals treated with antibiotics have been shown to reduce the overall effectiveness of prescribed antibiotics to human diseases.

Economic growth and transition

With the rate of global growth, our human footprint, and the consequent need for a diversified and innovative food production system, clean meat avoids many of the pitfalls inherent to the intersection of environment, health and socioeconomic aspects of our society. It is important that Canada creates the opportunities for a clean meat industry to flourish early and to position itself as a world leader in this burgeoning field. With proper investment and planning, Canada is poised to diversify its food production, reaping associated economic benefits and job creation stemming from the rapidly growing global clean meat market.

Environmental protection

The process of raising animals for human consumption is fundamentally inefficient, with a progressive loss of energy throughout the trophic chain, directly conflicting with efforts to optimize efficiency within the food supply. Evidence suggests that as worldwide demand for animal protein continues to accelerate, the negative impacts on environmental sustainability will similarly increase. Soil degradation, increasing water use, greenhouse gas emissions and deforestation are all exacerbated animal agriculture.

A growing population

The goal of the international food system is to feed people effectively on a global scale, while combating the wide-ranging environmental problems associated with food production. A growing global population will only increase the severity and urgency of these issues. Currently, the earth is projected to have a population of 10 billion people by 2050 - highlighting the need for our global agricultural system to enhance production at a rapid pace.

POLICY ASKS

GRANTS & FINANCES:

Provide clear access to grants and financing for the clean meat industry

JOB TRAINING PROGRAM:

Develop programs in conjunction with the educational sector on clean meat and relevant job training programs

REGULATIONS:

Develop fair and accessible regulations for the clean meat sector

CULTIVATED MEAT AND THE ENVIRONMENT

Conventional animal agriculture is extremely inefficient. As it stands, the industry requires massive inputs of land, water, energy and even previously grown food to obtain animal products. The previously grown food feeds animals which are then eaten. It's been widely shown that reducing traditional animal agriculture products from one's diet is the biggest way an individual can reduce their environmental impact. Though studies are still in early stages, cell meat provides significant hope to create meat while significantly reducing the environmental burden (figure below).

Quick Facts:

83% of farmland and 60% of greenhouse gas emissions can be directly attributed to animal agriculture despite it only providing 18% of our total caloric consumption (Figure 2).

Conventional animal agriculture is the leading cause of ocean dead zones and habitat destruction.

The World Wildlife Fund's (WWF) recent report states that changing food production and consumption is the only way to bend the curve of biodiversity loss.

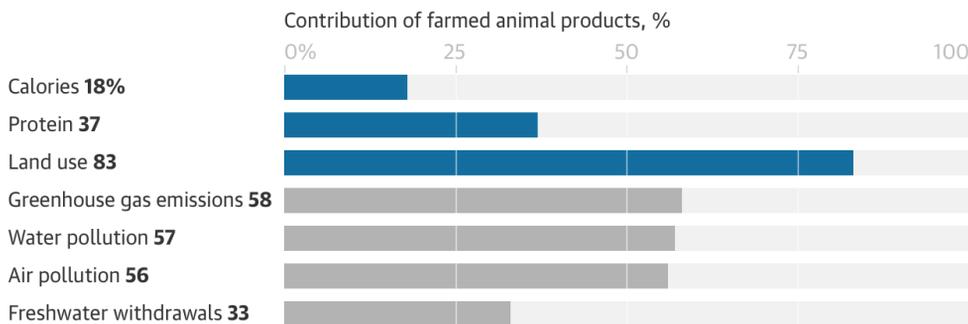
Environmental Protection

Clean meats achieve the ideals of producing meat with a fraction of the environmental cost of conventional animal farming. Though the field remains new, early studies demonstrate very promising results.

Depending on the products compared, it's expected to reduce greenhouse gas emissions between 78-96%, lower land use by a massive 99% and reduce water use by 82-96%. With beef's environmental cost being the highest, its clean meat counterpart is astonishing. It's estimated that the lab grown substitute for beef would reduce land use by over 95% and greenhouse gas emissions by 74-87%.

CLEAN CHICKEN		CLEAN BEEF		
35% - 67%	70%	95%+	74% - 87%	94%
% less land used	% of nutrient pollution reduction	% less land used	% of climate change emissions reduction	% of nutrient pollution reduction

More than 80% of farmland is used for livestock but it produces just 18% of food calories and 37% of protein



Guardian Graphic | Source: Poore and Nemecek, Science

Climate change is the challenge that will define the next century. With increasing global temperatures and extreme weather patterns, virtually every industry and the lives of every citizen will be disrupted and endangered by international instability. Canada, in particular, is being disproportionately hit with many of the impacts, including warming at twice the global rate.

Our country is already experiencing increased precipitation (especially in winter), increased risk of fire, water supply shortages in summer, and a heightened risk of coastal flooding. Canada must seriously work on addressing these changes. Per capita, Canada produces three times more greenhouse gas emissions than the G20 average and ranks an embarrassing 15th out of 17 countries on greenhouse gas emissions. Significant changes must occur if Canada wants to begin addressing the environmental catastrophe it is helping to create.

*Note: Clean meat, cultivated meat, cellular agriculture, cultured meat, and lab-grown meat are all synonymous terms for the same technology and are used throughout the document

CULTIVATED MEAT AND HEALTH & DISEASE PREVENTION

Cultivated meat demonstrates many distinct advantages over conventional animal products from a health perspective. With its preparation in a sanitized space that does not involve raising animals, it will address concerns around foodborne illness. The growing global trend of antibiotic resistance will also be addressed as cultivated meat will not require its use to prevent disease in animals.

Antibiotic resistance is a growing global problem. In the USA, 80% of antibiotic sales are for livestock. Over time, in low doses the bacteria become more resistant to the drugs used in human medicine. This means the antibiotics physicians are currently reliant on to address many common illnesses are becoming less effective at treating infections worldwide.

Foodborne illness is an unavoidable consequence of using farm animals to create meat. Raising animals, often in confined and fecal covered spaces is simply incredibly dangerous to human health to be eating products contaminated with fecal bacteria and leads to many health complications that wouldn't occur in a sterile lab setting.

The brain parasite *Toxoplasma gondii* can affect all warm-blooded animals. Toxoplasmosis results primarily from the consumption of the meat of pigs, poultry, sheep, and goats. The parasite can cause miscarriages, blindness, or developmental delay of infants through invasion during pregnancy. In adults, it can impair cognitive functioning which is associated with certain psychiatric disorders and may even increase the risk of developing leukemia.

Another well-known pathogen is *Salmonella*, which infects 1 in 7 packages of poultry in the United States. Salmonellosis can cause conditions like dehydration, reactive arthritis, or bacteremia where the bacteria infect tissues throughout the body.

E. coli is perhaps the most well-known pathogen and it currently infects over 90% of packages of ground turkey, chicken breast, and ground beef. *E. coli* infections can cause stroke, seizures, and kidney failure in rare cases.

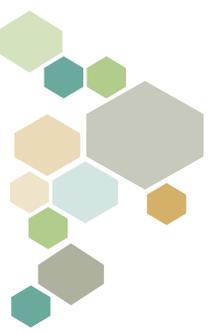
Quick facts:

- Salmonella infects 1 in 7 packages of poultry in the United States
- E.coli infects over 90% of packages of ground turkey, chicken breast, and ground beef
- In the USA, 80% of antibiotic sales are for livestock
- With increased demand for animal products comes increased density of animals per factory farm, reduced genetic diversity, increased risk of disease, and increased risk of transmission of zoonotic disease.
- A meta-analysis of 900 studies (2000 - 2018) found that the proportion of bacteria that are no longer responsive to existing drug treatments had tripled.

The current state of global health also urges an examination of the direct relationship between animal consumption and public health; the tie between the Sars-COV-2 virus and animal agriculture is inextricable. With increased demand for animal products comes increased density of animals per factory farm, reduced genetic diversity, increased risk of disease, increased instances of abuse and neglect, and increased risk of transmission of zoonotic disease.

The COVID-19 outbreak was catalyzed by the conventionality of animal consumption. Several animal agriculture processing plants have been severely affected by this pandemic as they have been epicenters of the disease. Cargill, the Harmony Beef Company, and JBS are all processing plants whose workers have been impacted catastrophically by the pandemic, and they are responsible for over 70% of the beef processing that occurs in Canada. They are believed to have facilitated the transmission of the disease through extreme crowding of both animals and working human staff, leading to meager physical distancing, improper safety protocols, and lack of education of the disease among upper-level management.





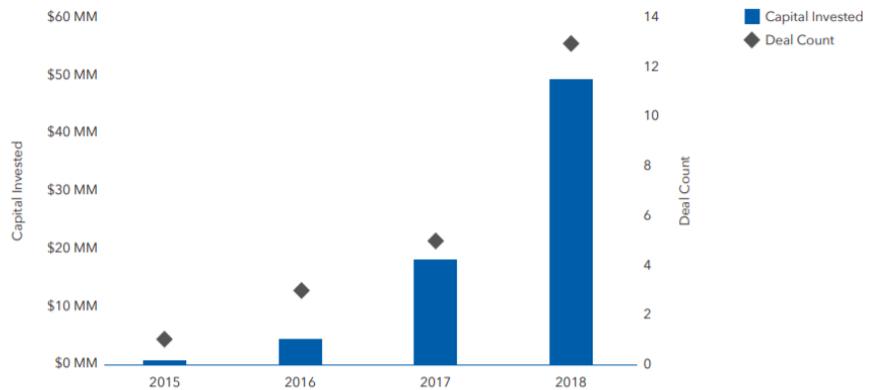
CULTIVATED MEAT AND BUSINESS & ECONOMICS

The global consumption and demand for meat continues to grow at a phenomenal rate and developing countries copy Western diets, yet the cost of meat on the environment and human health is massive. The technology of cell-based meat allows to produce meat with significantly less of the costs of conventional meat. Canada has the choice to reap the economic benefits and job growth from this technology by investing early and allowing the industry to flourish in Canada, or to have our agricultural section left behind with missing job opportunities and selling to foreign markets.

Quick facts:

- Singapore's science and technology budget includes \$144 million for research and development which includes clean meat
- Singapore has given regulatory approval for the world's first cell-based meat to be available from the San Francisco based start-up, Eat Just to sell lab-grown chicken meat
- 2/3 of Americans are willing to try clean meat, a majority were interested in it as a replacement for conventional meat, and 2/5 said that they would even pay a premium for the product.

Cell-based Meat Investment History by Capital Invested and Deal Count



Source: GFI custom PitchBook analysis of cell-based meat companies. Does not include companies that are pursuing cell-based meat as one aspect of a larger business.

Economic growth and transition

Clean meat is the revolution on the forefront of the agricultural industry (figure above). It has many distinct advantages that when produced on a large scale, quickly overcome many of the disadvantages associated with conventional meat. Clean meat can be produced more swiftly yet requires fewer resources (e.g. food and water), land requirements, and ethical considerations. Just as cars replaced horse-drawn carriages and alternative fuels replaced some of the needs of the whaling industry, clean meat is an up and coming technological advancement poised to disrupt conventional animal agriculture.

With the rate of global growth and need for diversified and innovative protein options, it is important that Canada creates the opportunities for clean meat production to flourish locally and avoid its industry and country being left behind with older technology. With proper planning, our country can benefit significantly through job creation and economically through the benefits of a rapidly growing global market. It provides a means for Canadian consumers to purchase Canadian products which strengthens communities and reduces reliance on imports. These changes may be coming incredibly quickly. The economic think tank, RethinkX, predicts that by 2030 the number of cows in the United States will have declined by 50% with other livestock industries following suit. Developing the opportunities for highly skilled entrepreneurs, scientists, and researchers to join this field will open up a wealth of new jobs, addressing many current job concerns.



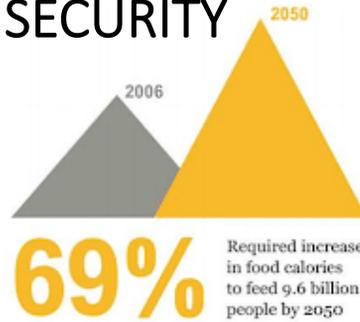
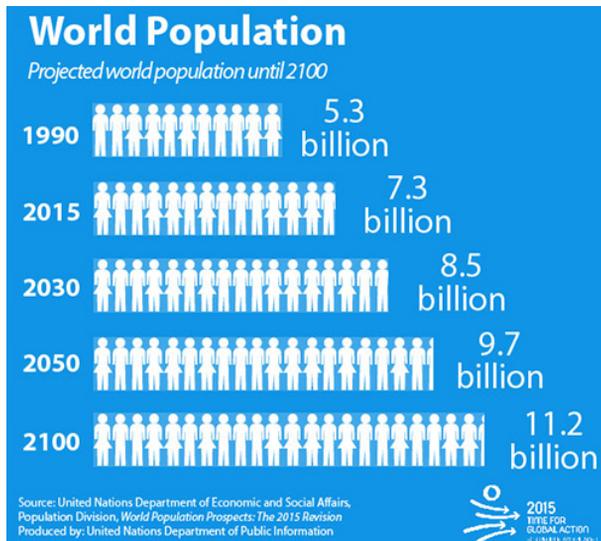
Source: Technavio via Business Wire, Published February 28, 2020

CULTIVATED MEAT AND FOOD SECURITY & POPULATION GROWTH

Population growth continues at a significant rate, with the earth projected to have about 10 billion people by 2050. With the unpredictability of climate change, growing antibiotic resistance, foodborne illness and the demand for increased food production, cultivated meat provides a technological advantage to address these challenges in a world of growing uncertainty.

A growing population

The goal of the international food system is to feed people effectively on a global scale, while combating the wide-ranging environmental problems associated with food production. A growing global population will only increase the severity and urgency of these issues. Currently, the earth is projected to have a population of 10 billion people by 2050 - highlighting the need for our global agricultural system to enhance production at a rapid pace (figure below).



WORLD RESOURCES INSTITUTE

Source: <http://www.wri.org>

POPULATION GROWTH OUTPACES FOOD SUPPLY

Even if food was distributed more evenly around the world, we still face a massive calorie gap between current food production, and food production required in the future.

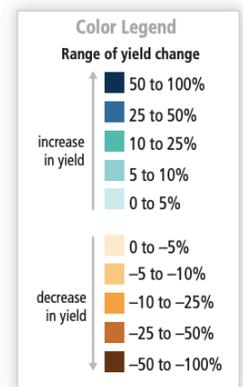
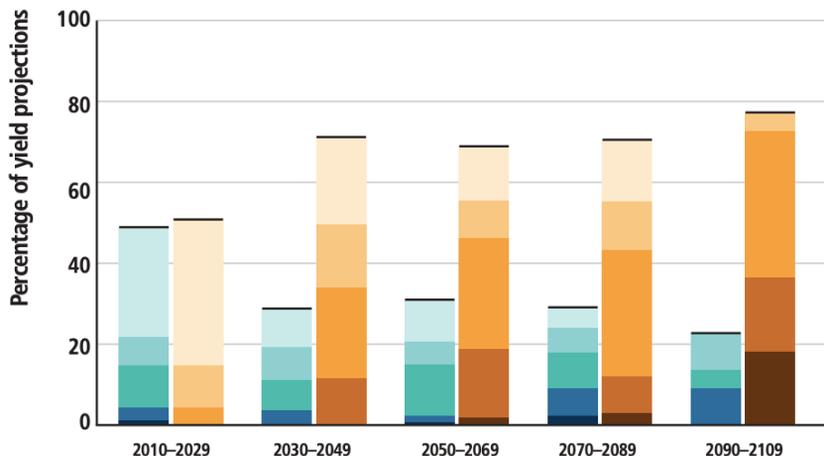
At the same time, climate change will negatively impact global agriculture. In many areas, it already has.

Looking ahead

These problems collectively pose significant threats to human lives and our overall character. Climate change is increasing at an alarming rate, causing the environment to become increasingly unstable and degrade. With the rise of antibiotic resistance and foodborne illness come unprecedented health and financial costs.

With the rise in global population, these problems take on another level of severity. Currently, the earth is projected to have about 10 billion people by 2050. This means that global agricultural systems need to create significantly more output and do so quickly. Unfortunately, many growing countries are following in the footsteps of developed countries and eating an increasingly meat-focused diet, growing the scale of these already massive problems. As a country, we need to change our approach to agriculture and adjust the current system to address and mitigate these externalities as well as meet global nutritional needs to avoid mass starvation.

Climate change is also predicted to severely impact crop yields all over the world, which will have sequential effects through the chain of production in animal agriculture. The effects of droughts, torrential rain, monsoons, increased pest invasion as a result of antibiotic resistance and general genetic recombination are predicted to devastate the state of agriculture as we know it, and we must be prepared to shift away from it. Producing this technology nationally will help ensure we are able to meet our nutritional demand regardless of the external circumstance.



Source: Andrew J. Challinor et al., *Climate Change 2014: Impacts, Adaptation, and Vulnerability* (New York: IPCC, 2014), https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-Chap7_FINAL.pdf.

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