



The Importance of Livestock Production and Animal Protein: The Western Hemisphere Perspective

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The Importance of Livestock Production and Animal Protein: The Western Hemisphere Perspective

The global population is projected to reach nearly 10 billion people by 2050. This population growth will contribute to numerous social challenges including food insecurity, poverty, resource scarcity and climate change. Addressing these social challenges, among others, will require collaborative and systems-wide efforts of all actors around the world. The global livestock sector has an important role to play as a driver of sustainable food production while also prioritizing nutrition, innovation, safety, quality, productivity and efficiency to meet the needs and challenges of the growing global population.

Sustainable food and agricultural production does not simply encompass environmental impact. Environmental sustainability, including reducing the impact of production on land, water and air, is a key component to a sustainable food system, but social and economic factors are also critical components of what makes a food system truly sustainable. Social sustainability ensures people are taken care of, for example, by having access to safe and nutritious foods, and also ensures societies have resources available for subsequent generations. Economic sustainability fosters long-term economic growth and profitable work for farmers and ranchers as well as other food system actors.

Science-based decision making is the backbone to achieving a sustainable food system. Scientists around the globe are making significant contributions to advance sustainable production, including providing

the livestock industry with safe yet cutting edge tools to enhance all aspects of animal care, reduce environmental footprint, assess economic impact of both small and large operations and, ultimately, improve human nutrition. Food system actors are embracing these technologies to drive change in a manner that reflects their unique local conditions. To support continued adoption of technology, it is imperative that peer-reviewed, evidence-based science inform and guide conversations regarding sustainable food systems. Science- and risk-based regulatory frameworks play a role in both protecting consumers and ensuring fair practices in food trade, two essential goals that any sustainable food system must maintain at its core.

This collection of position papers brings together expert perspectives from throughout the Western Hemisphere to examine some of the most pressing issues facing livestock production. Livestock production and animal protein are essential for sustainable food systems for myriad reasons including the important role that animal protein plays in healthy diets, the commitments that farmers and ranchers have already made to environmentally sustainable production as well as the exciting technologies that will help them continue to prioritize the environment while also increasing productivity and efficiency, and also the development of rural communities across the globe. The livestock industry is uniquely positioned to be a leader and significant contributor in global food system discussions.



About IICA: The IICA board is comprised of Secretaries and Ministers of Agriculture of 34 countries in the Western Hemisphere including 14 member states in the Caribbean. IICA supports the efforts of Member States to achieve agricultural development and rural well-being with the aim of achieving a competitive, inclusive and sustainable agriculture sector. IICA also helps Member States participate in international standard setting bodies such as Codex Alimentarius and the World Trade Organization.



About USDEC: USDEC is a non-profit, independent membership organization that represents the global trade interests of U.S. dairy producers, proprietary processors and cooperatives, ingredient suppliers and export traders. USDEC represents roughly 110 members who are interested in making sure that the U.S. dairy industry is participating in export opportunities and helping to feed the world.

Food Systems and Global Sustainable Livestock Production



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The answer to the question of a resilient and sustainable food system is not about completely revolutionizing the system, it's about evolving established institutions to reduce environmental impact while simultaneously enhancing farm livelihoods and food quality.

The United Nations (UN) defines a food system as the constellation of activities involved in producing, processing, transporting and consuming food and that the health of our food systems profoundly affects the health of our bodies, as well as the health of our environment, our economies and our cultures.ⁱ The Food and Agricultural Organization (FAO) defines a sustainable food system as one that delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations is not compromised. This means that it is profitable throughout, ensuring economic sustainability, it has broad-based benefits for society, securing social sustainability, and that it has a positive or neutral impact on the natural resource environment, safeguarding the sustainability of the environment.ⁱⁱ One critical part of this definition is the emphasis on economic viability because without economic viability there is no foundation on which sustainability of social and environmental factors can be built.

Food systems are a topic of concern because of the need to feed a rapidly growing world population on a planet with finite resources. There are fragilities within existing food systems that can have profound and far-reaching impacts on multiple aspects of life including health, education and the economy among others. All agriculture, including the livestock sector, must approach these challenges head-on and work collaboratively to seek solutions to the myriad problems existing in the world. The answer to the question of a resilient and sustainable food system is not about completely revolutionizing the system, it's about evolving established institutions to reduce environmental impact while simultaneously enhancing farm livelihoods and food quality.

2021 Food Systems Summit

In October 2019, António Guterres, Secretary-General of the UN, announced the intention to hold the first-ever



Food Systems Summit in late 2021. Organizers envision the Summit will make a global impact to transform the way the world produces, consumes and thinks about food and to establish actionable steps toward achievement of the Sustainable Development Goals (SDGs) by 2030. The SDGs were introduced in 2015 as a blueprint to achieve a better and more sustainable future, but there is concern that not enough progress has been made so the Summit is viewed as an opportunity to galvanize commitments related to the SDGs. The Food Systems Summit will be a point in time, but the proceedings, political declarations and outcomes regarding food systems will extend well beyond the summit and will permeate UN processes for many years to come which could have a significant impact on the livestock industry.

The Summit has five overarching objectives that include: ensuring access to safe and nutritious food for





all, shifting to sustainable consumption patterns, boosting nature-positive production, advancing equitable livelihoods and building resilience to unpredictable vulnerabilities. Officials aim to achieve actionable commitments and measurable outcomes on all the SDGs with calls to action at all levels of the food system. They also aim to elevate public discourse about the importance of food systems and to deliver a high-level set of principles to leverage the capacity of food systems to support the SDGs as well as a process for measuring progress and sharing best practices.

The Summit is operating under the leadership of UN Special Envoy Dr. Agnes Kalibata who has years of experience as an agricultural scientist, policymaker and thought leader. Dr. Kalibata is supported by three operational functions including an advisory committee, a UN task force and an independent scientific group. The individuals who serve on these operational function groups include leading researchers and scientists, healthcare, academia, farmers, indigenous peoples, civil society, environmental activists and business leaders. The Summit is also supported by a number of technical

and subject-matter experts serving on the Champions Network or Action Track working groups. The individuals appointed to these roles will be critically important for the livestock industry because they represent every region of the world, they will encourage coordinated action before, during, and after the summit and, perhaps most important, they have the opportunity to bring the unique opportunities and concerns of the industry into the conversation. For example, the current chair of the International Agri-Food Network (IAFN) was appointed to serve on the Champions Network which may help the industry navigate positioning of agriculture and livestock within the Summit. Conversely, individuals from groups such as the non-profit EAT Foundation have also been appointed to serve the Summit. They will bring the perspective of a recommended shift in food consumption patterns away from animal products, emphasizing a plant-forward diet and the so-called Planetary Health Diet.

As part of the Summit planning, organizers intend for all countries in the world to host a series of three food system dialogue sessions to provide an opportunity for governments and communities to discuss their food systems and to identify ways that these may be strengthened. This is a critically important opportunity for representatives from the livestock industry to participate in their respective countries. Ultimately individual countries will decide what the outcome of the Summit is and how those will be implemented. As such, being part of the conversation and engaging very proactively at the country-level in the food systems dialogues is essential.

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Another element with the potential to significantly impact food systems is the constantly evolving scientific landscape. In this day-in-age, pseudoscience, opinions and agendas are often elevated to the same level as fact-based, peer-reviewed science. It is important that industry stakeholders across the globe take an active role to ensure that robust science-based evidence is used in the production of the Summit and its outputs. Individuals serving on the Independent Scientific Group supporting the Summit are intended to be independent, but bring with them individual interests and backgrounds. For example several members of the scientific group have connections to EAT and one was among the commissioners of the EAT-*Lancet* report that proposes a plant-forward diet. Additionally it is rare for private sector representatives to be included when forming high-level panels of experts and this poses an extreme risk where the private sector may be marginalized.

Global Dairy Platform Food Systems Strategy



GLOBAL DAIRY PLATFORM

The Global Dairy Platform (GDP) represents dairy companies, associations, scientific bodies and other partners to collaborate pre-competitively to lead and build evidence on dairy's role in the diet, and show the sector's commitment to responsible food production. GDP has been working on the concept of food systems for nearly seven years. In 2016, GDP held the Chicago Ecosystem Inception workshop resulting in "The Chicago Consensus on Sustainable Food Systems Science", a report that examines a systems approach to



The Chicago Consensus on Sustainable Food Systems Science

Adam Drewnowski* and The Ecosystem Inception Team

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As participants at the Ecosystem Inception Meeting convened by the Global Dairy Platform and held in Chicago in June 2016, we have identified some concepts as central to the study of food systems science. Following the definition developed by the Food and Agriculture Organization for sustainable diets, the food supply needs to provide foods that are healthy and safe, affordable, culturally acceptable, and with low impact on the environment. Therefore, the four main domains of sustainable food systems science can be described as health, economics, society, and the environment. Food systems science needs to embrace and engage with all relevant allied disciplines that may include environmental health sciences, epidemiology, geography, history, sociology, anthropology, business, and political science. Research and training in food systems science, both domestic and international, would benefit from a set of competencies, from more extensive research networks, and from more public-private engagement. This document builds on major advances in the area of food system research, training, and practice, already achieved by individuals, institutions, foundations, and local and national governments.

Keywords: food systems, nutrition, sustainability, cost, environment

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ELEMENTS OF SUSTAINABLE FOOD SYSTEMS SCIENCE

The operations of modern agricultural and food systems span the continuum from food production and processing to food consumption, nutrition security, and population health. The chain of food production ranges from agriculture and livestock to commodity trades, food processing, distribution, and retail. On the consumption side are economic, cultural, and behavioral factors, ranging from the pricing and marketing of foods to individual and group food purchases and food consumption patterns. Food systems, both local and global, can be profoundly influenced by the perturbations in the food supply and by changing consumer demand.

The operations of the global food system can have a profound impact on economies and trade, as well as on political stability at local, regional, and global scales. The food system can affect, if not shape, current and future food and nutrition security and global population health. The food system can be disrupted by social, economic, and political events as well as by environmental factors that may involve depletion of natural resources, global warming, and climate change. Conversely, economic development, as manifested by the nutrition transition, can affect food choices and eating habits on a population scale.

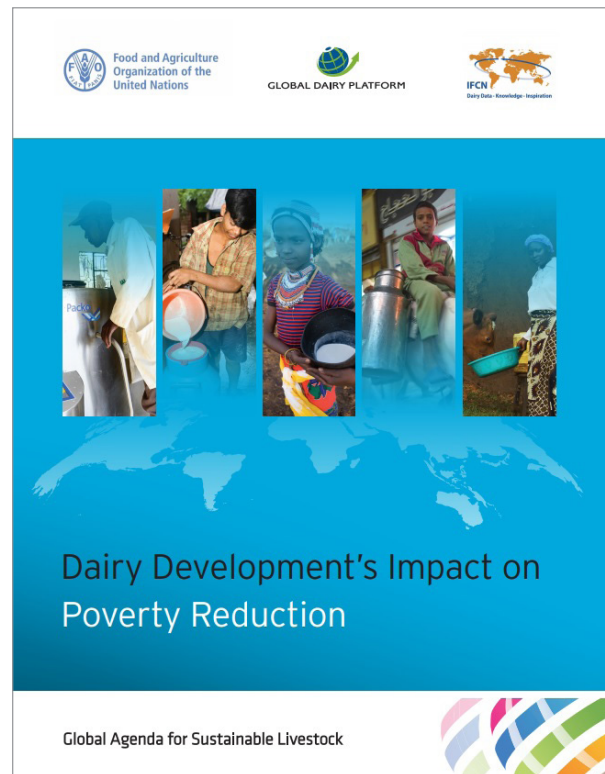
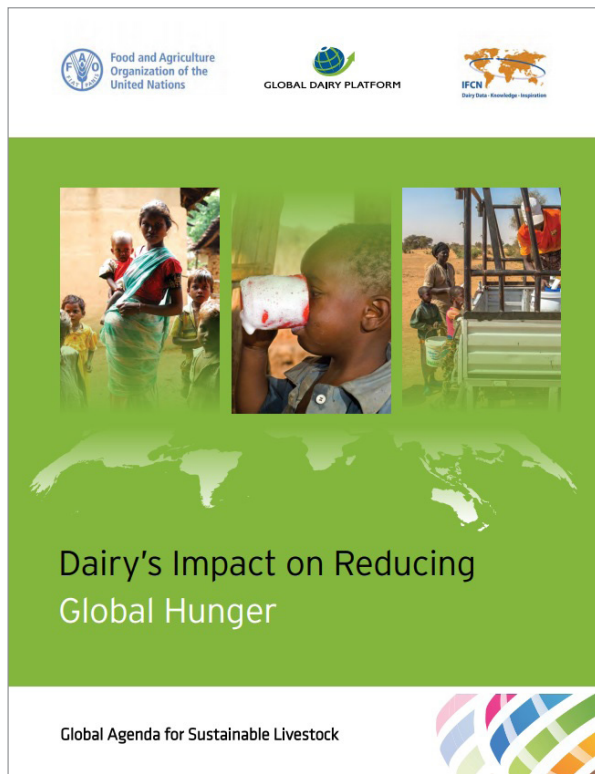
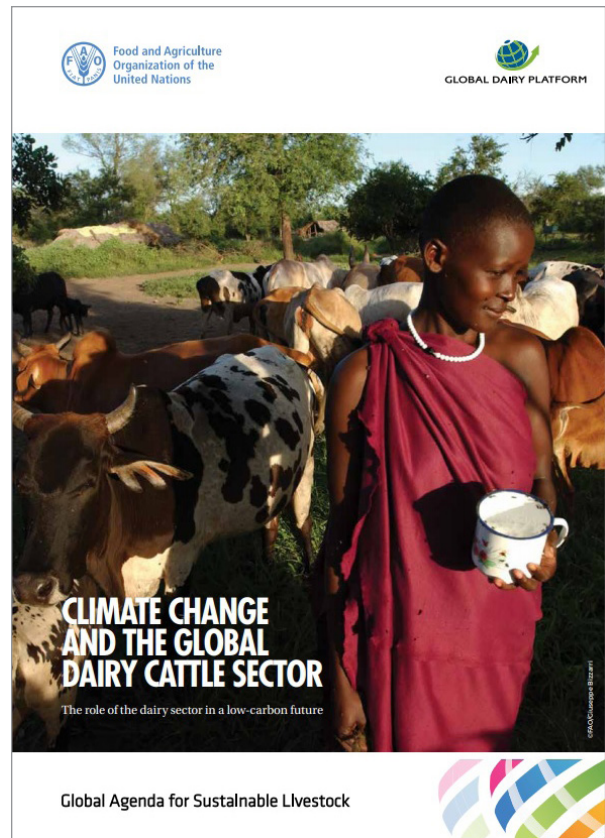
The four domains of sustainable food systems science can also be conceptualized as health, economics, society, and environment. Research and training in the new discipline, with population health at its core, are by definition, interdisciplinary (1). Consistent with the principles of the Giessen Declaration (2), the "new" nutrition science is ready to embrace and engage with diverse

sustainability and encourages inclusion of the totality of the food system in the discussion. All too often people focus on segments of the production system, particularly on the consumption end of the system, resulting in suboptimal decisions that ignore the potential impact on the production and processing end of the system.

In order to provide evidence that supports the importance of the totality of the food system, GDP engages and builds trust with global agencies and serves as an active leader with several stakeholder organizations.

All too often people focus on segments of the production system, particularly on the consumption end of the system, resulting in suboptimal decisions that ignore the potential impact on the production and processing end of the system.

Since 2016 GDP has participated in thought-leader meetings such as with the UN Committee on World Food Security that examined issues with nutritional security and livestock as well as nutrition and food systems. Also in 2016 GDP became involved with the Global Agenda for Sustainable Livestock (GASL) in order to engage with like-minded organizations focused on making livestock more sustainable. GDP encouraged GASL to form the Livestock for Social Development action network which has now published a number of reports that serve as evidence in food systems conversations.^{iii, iv, v} GDP worked with GASL and FAO to publish joint reports examining the impact of the dairy industry on poverty reduction and reducing hunger and plans to publish reports in the near future on gender equality as well as youth access to employment with respect to the dairy industry. In 2019, GDP launched the Dairy Nourishes Africa initiative that demonstrates the impact dairy can have to reduce poverty and reduce issues of malnutrition, stunting and wasting in children by the introduction of high-quality protein from dairy.



The global dairy industry has also made a significant commitment to examine greenhouse gas (GHG) emissions from the global dairy cattle sector, encourage innovative solutions to reduce emissions and ultimately track and report progress. Agricultural emissions represent 24% of the world's GHG emissions and within this total 14.5% is attributed to livestock and of that segment, 2.5% is attributed to the dairy sector. There is a large disparity between GHG emissions in established versus emerging

dairy nations. The U.S. averages 1.1-1.2 kilograms of carbon per kilogram of milk produced, whereas in parts of Africa and other parts of the developing world, the carbon emissions are often 12-20 kilograms of carbon per kilogram of milk produced. GDP, in conjunction with other industry organizations, is helping to lead a strategy where leaders, such as the U.S. dairy industry, can model GHG emission reduction pathways to help move the needle on GHG emissions at a global scale.



U.S. Dairy Net Zero Initiative

The Net Zero Initiative (NZI) is an industry-wide, on-farm effort that will play a key role in helping U.S. dairy reduce the environmental impact of the industry. This unique initiative is coordinated through the Innovation Center for U.S. Dairy, a voluntary organization that works with leaders from across the dairy value chain to align on pre-competitive priorities, drive progress and speak with one voice. The organization is made up of 27 board companies representing some of the most familiar household brand names in the dairy industry including major cooperatives as well as U.S. dairy policy organizations. Nearly 70% of the U.S. dairy industry is represented in the organization.

In March of 2020, after nearly 18 months of strategic discussions that examined research, assessed customer concerns and set industry sustainability priorities, the CEOs representing the 27 member companies unanimously voted via roll-call vote to commit to goals of the

initiative. The goals, to be achieved by 2050, include becoming carbon neutral or better, optimizing water use while maximizing recycling, and improving water quality by optimizing utilization of manure and nutrients. There are two strategic pathways to achieve the goals including the aforementioned NZI for field and farm and also a Processor Working Group for processors.

Six organizations representing various aspects of the U.S. dairy industry are working in collaboration to achieve the goals of NZI. The organizations include Dairy

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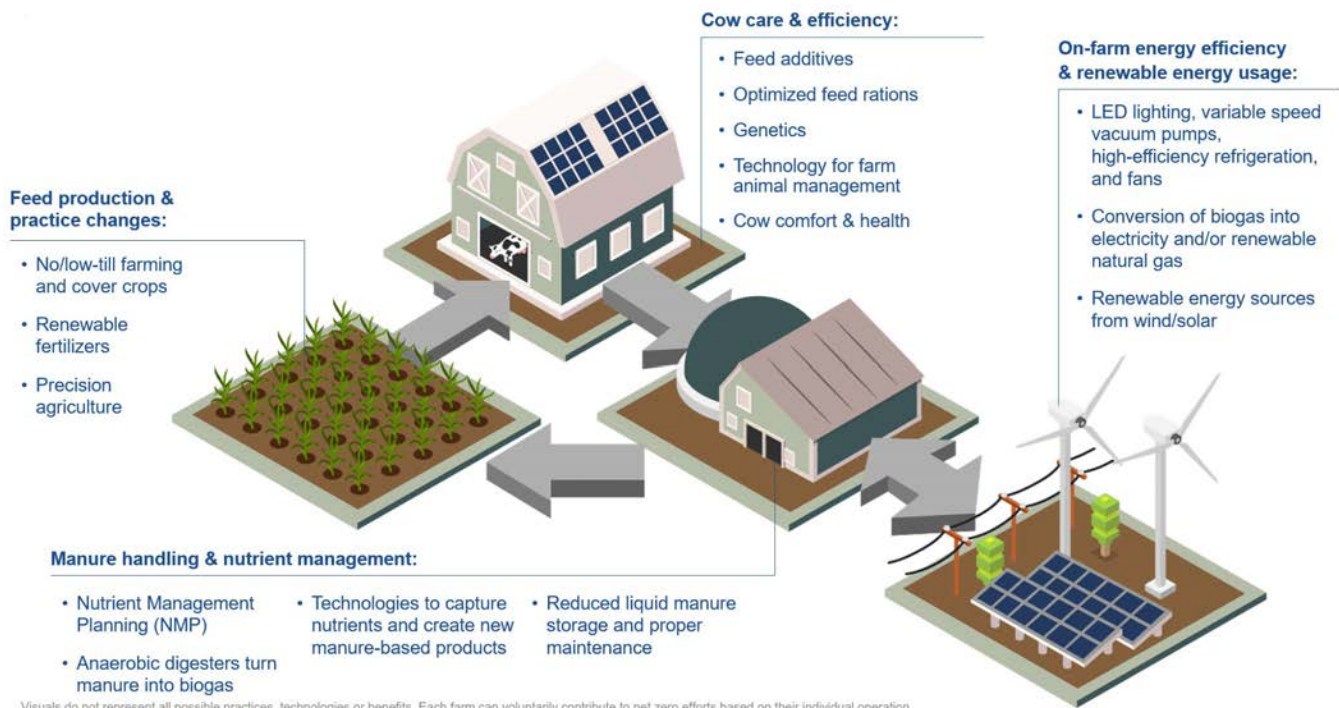
Management, Inc. (DMI), the Innovation Center for U.S. Dairy, National Milk Producers Federation (NMPF), Newtrient, U.S. Dairy Export Council (USDEC) and the International Dairy Foods Association (IDFA). NZI does not involve buying or borrowing carbon credits from any other organization or industry and will be achieved solely within the dairy industry. NZI is voluntary and a collective effort of all farms where not every farm will reach net zero status, but net zero can be achieved as an industry by averaging out the collective effort of all farms. NZI considers a range of technologies and practices on farms of varying sizes, designs and geographies and opens opportunities for farms of all sizes to adopt technologies and practices.

NZI begins with foundational groundwork conducting environmental and economic analysis as well as research and measurement to inform decisions that will benefit all dairy farms. Dairy farming in the U.S. varies widely across the country due to geography, climate as well as scale and size of the farm so NZI will not be a one-size-fits-all approach. A small set of pilot farms will implement all NZI

Ultimately NZI intends to connect farms of all sizes, regions and designs to technical, financial and educational support to motivate the adoption of environmental practices across the industry.

efficiencies initially to prove the business case and be a catalyst for solutions on all farms. Ultimately NZI intends to connect farms of all sizes, regions and designs to technical, financial and educational support to motivate the adoption of environmental practices across the industry. Farmers want to see that NZI can make a difference for their operation, not only environmentally but also with productivity and profitability in order to be motivated to make an investment in changes to support the initiative.

Application of NZI will look different at each participating farm, but program innovations generally occur in one of four areas including feed production and



practices, cow care, on-farm energy efficiency and renewable energy usage, and manure handling and nutrient management. In the area of feed production innovations include no-till/low-till farming and cover crops, renewable fertilizers and precision agriculture among others. Additional research is needed to learn more about best practices in this area, but a major grant will provide funds to conduct this research over the next six years. With respect to cow care progress in the areas of feed additives, optimized feed rations, genetics and cow comfort and health will support the NZI. Energy efficiencies include utilizing LED lighting, variable speed vacuum pumps, high efficiency refrigeration and fans. Examples of opportunities to increase renewable energy usage on farm include conversion of biogas into electricity and/or renewable natural gas and utilizing renewable energy sources from wind/solar power. Finally, in the area of manure handling and nutrient management, innovations to support NZI include Nutrient Management Planning (NMP) and technologies to capture nutrients and create new manure-based products. As previously stated, NZI will look different at each participating farm and the aforementioned

practices and technologies are not an exhaustive or prescribed list for participating farms.

Corporate partners are critical to the success of NZI in order to help alleviate the burden of costs on individual farmers. In October 2020, the Innovation Center for U.S. Dairy announced a multi-year partnership for as much as \$10 million with Nestlé to help scale access to sustainable resources and practices on U.S. farms. Securing more partners including NGOs and multinational corporations is a high priority because they not only provide financial support, but also lend their expertise. This mutually beneficial partnership also helps industry of all types to address their environmental footprint.

Demands and Challenges for the Brazilian Beef Industry

The beef industry in Brazil has changed rapidly over the last 20 to 25 years. The major catalysts that propelled the industry from one that served mainly the local population to one that is a significant exporter include,



World demand for meat is projected to increase by 35% in the next 20 years, particularly in emerging countries.

improving animal health status that made more countries receptive to Brazilian beef, the 2001 bovine spongiform encephalopathy (BSE) crisis in Europe, and significant growth in new and emerging markets including Russia, the Middle East and Asia.

There are currently more than 200 million animals in the Brazilian beef herd and the \$157 billion industry is in every municipality across Brazil. World demand for meat is projected to increase by 35% in the next 20 years, particularly in emerging countries. Because of protein demand, Rabobank predicts that demand for soy will also grow an additional 70 million tones through 2028/2029 and nearly 50% of this demand could be met by Brazilian producers.^{vi} Brazil agribusiness is faced with the question of how to meet increasing demands while mitigating climate change and preserving biodiversity, particularly related to deforestation.

As demand for beef increases, land use for cattle production historically increased as well. Native lands never occupied before were being used as pastures and for other types of agriculture. As a result, the livestock industry is seen as a driver of deforestation. However, data from TerraBrasilis and Dados Agroconsult show that, over the last 10-15 years, deforestation rates have significantly declined, pasture land use has declined and livestock productivity has increased.^{vii, viii} Combined together, these data points indicate that the Brazilian beef industry is producing more using less land, but regardless the industry is associated as a driver of deforestation because cattle are generally the first to occupy deforested land. Additionally, the number of private-sector companies

making commitments to eliminate deforestation from their supply chain is on the rise so Brazilian beef producers need to implement sustainability practices to be both good stewards of the land and also to remain an attractive commodity supplier.

Intensification of land use and animal productivity is one way to address sustainability issues in the Brazilian beef industry. Compared to the U.S., the Brazilian beef herd has nearly twice as many animals, but meat production from those animals is less overall. To intensify animal productivity the industry needs to have more animals per hectare of land and/or produce more meat per animal. In order to do that, investments in genetics, nutrition and animal health need to be made. Brazilian production will always be pasture-based and one opportunity is to improve pasture production by good pasture management, fertilization and the introduction of new varieties of tropical grasses. Research published in *Agricultural Systems* demonstrates that grass pasture systems are a source of GHG carbon reduction, or a so-called carbon sink, so grass pastures can contribute to carbon-neutral beef production.^{ix}

Intensification of land use and animal productivity is one way to address sustainability issues in the Brazilian beef industry.

Another opportunity to intensify land use is integration systems between livestock production, agriculture and forests. An example of this integration is a farmer who first uses their land to produce soy followed by a harvest of corn on the same land. Then the same land is planted with grass that cattle then use as pasture land. This type of integration system is complex to manage, but the advantages are numerous when implemented successfully and producers have observed increased productivity and the resulting positive financial impact. Coordinating with agricultural producers to utilize



agricultural byproducts in the cattle industry is another intensification opportunity. Agricultural byproducts can be used to improve cattle nutrition, particularly during the dry season. This nutrition supplementation can help an animal be ready for slaughter in 18 months compared to four to five years without.

The Brazilian government created a low carbon agriculture plan that finances technologies to reduce carbon emissions including integration, pasture restoration, no-till farming, forest planting, nitrogen fixation and utilizing animal byproducts. While this program has helped increase pasture restoration and is largely viewed as a positive program, access to smaller producers is limited. There are also a number of private-sector supply-chain initiatives, sustainability certifications, roundtable initiatives and government-issued sanctions intended to decouple commodity suppliers from deforestation by recognizing desirable suppliers as those who have zero deforestation in their production. However

In order to tackle the problem of deforestation most effectively, public and private environmental policies need to complement each other and mechanisms for effective on-the-ground implementation are required.

these programs are difficult for producers to achieve due to all the requirements and investments that are necessary to achieve certification. Additionally, beef customers in emerging markets don't want to pay a premium price for a certified product. In order to tackle the problem of deforestation most effectively, public and private environmental policies need to complement each other and mechanisms for effective on-the-ground implementation are required.^x

Initiatives to combine the efforts of government, private sector and civil society do exist and one example is Produce Conserve Include (PCI) in the state of Mato Grosso, Brazil. PCI works to achieve sustainable production across all industries in the Mato Grosso territory by managing future agricultural growth within existing productive areas, restoring forests and involving all farmers and indigenous people regardless of the scale of their production. For example, by implementing land intensification measures, the projected future demand for increased soy production in

Brazil over the next 20 years could be entirely met by transforming pastures in Mato Grosso. These intensification measures would not only increase soy production, but livestock production would not decrease and, in fact, could grow. Transforming the rural landscape in Mato Grosso will require an investment of approximately \$12 billion over the next 15 years and these costs cannot be funded by farmers alone. Investments from international and domestic public organizations and public corporations are needed to support these efforts.

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Animal Protein in Global Dietary Guidelines



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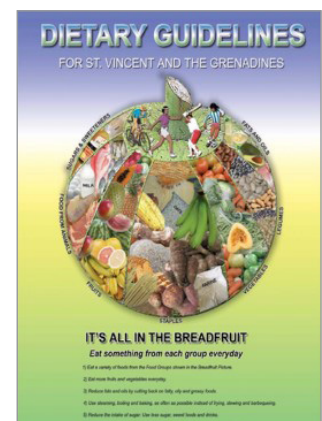
Nutrient dense animal sourced foods
have a critical role in the diet and
continue to provide essential nutrition
to people around the world.

The importance of healthy diets and sustainable food systems has never been more important as the world grapples with multiple converging pandemics including overweight and obesity, under-nutrition, climate change and most currently COVID-19. Food-based dietary guidelines, currently found in 94 countries around the world, represent a country's evidence-based interpretation of a healthy diet and reflect a commitment to supporting public health through nutrition. As we look to the near future, dietary guidance will also be formulated in the context of nourishing populations amidst unprecedented population growth and resource limitations. However, at present, nutrition advice regarding consuming animal-sourced foods is often contradictory and confusing. Additionally, the role of animal-sourced foods in dietary guidance is shifting towards an increased emphasis on plant-based foods in response to reports from authoritative bodies including the World Health Organization (WHO) and the Global Panel on Agriculture and Food Systems for Nutrition. However, nutrient dense animal sourced foods have a critical role in the diet and continue to provide essential nutrition to people around the world.

The Evolution of Dietary Guidelines

In 1992, a report from the International Conference on Nutrition recommended that governments provide advice to the public in their respective countries on qualitative and/or quantitative dietary guidelines.ⁱ Dietary guidelines have far-reaching implications, from high-level policy to consumer choice and access to food. They influence food procurement for schools, military, prisons and food assistance programs and can be the foundation of regulations and reformulation efforts, nutrition education and assistance programs and policies like front-of-pack labeling, taxes and marketing restrictions. In the U.S., The Dietary Guidelines for Americans (DGA) drive approximately \$80 billion in annual spending at the federal level alone.

Many countries go beyond considering only nutrient adequacy and reducing hunger in their dietary guidelines. Dietary guidelines now aim to reduce and eliminate chronic disease, address the role of food processing in the diet and some consider the impact of dietary guidelines on the environment. Environmental sustainability is addressed in the food-based guidelines of 52% of countries including Argentina, Brazil, Colombia and Peru and, of those, nearly half have sustainability considerations relevant to animal-sourced foods.ⁱⁱ Another new topic addressed by dietary guidance is food processing including recommendations to reduce consumption of ultra-processed foods. Latin America, spearheaded by Brazil, has been at the forefront of policymaking around consumption of ultra-processed foods and this trend is growing in Europe and the Near East.



Challenges for Future Guidelines

It is projected that the population will grow by one-third over the next 30 years, reaching almost 10 billion people worldwide by 2050. This is going to require a dramatic increase in food production which will need to be accomplished while reducing impact on natural resources. As part of the 2030 Agenda for Sustainable Development, the UN General Assembly formed the 17 SDGs to try to address the daunting challenges facing the health of people, the planet and economies. Malnutrition and climate change are two of the biggest driving forces creating a sense of urgency to transform food systems globally. Dairy and meat can play a significant role in achieving goals that deal with ending hunger, achieving food security, improving nutrition and promoting sustainable agriculture.

It is essential that a holistic view that examines both environmental issues as well as nutritional trade-offs is taken in order to avoid unintended consequences of focusing on environmental sustainability issues alone. Focusing on environmental sustainability alone does not fully account for the nutritional, social, and economic contributions of animal-sourced foods in healthy, affordable dietary patterns.

The current focus on sustainable diets in the context of environmental impact is largely on GHG emissions. Global food systems are complex and it is important to expand the focus beyond GHG emissions to also

It is essential that a holistic view that examines both environmental issues as well as nutritional trade-offs is taken in order to avoid unintended consequences of focusing on environmental sustainability issues alone.

include land use, water use, soil health and biodiversity loss. There is also a need to address the quality of metrics available to assess environmental issues and the accuracy with which they can be paired across different regions. There are established metrics to measure GHG emissions, but the quality of metrics available to assess other environmental issues such as biodiversity, soil health and water usage are still in development.

Dairy Recommendations Across the Globe

The vast majority of global dietary guidelines recommend daily intake of dairy foods. Dairy foods are recognized as nutrient-rich, particularly for their contribution of high-quality protein, calcium, potassium, vitamin D (when fortified), iodine, and vitamin B12. Calcium is an under-consumed nutrient across the globe and dairy foods are the number one source of calcium in the food supply. Many dairy foods are also considered minimally-processed which is important in the context of the increasing focus on food processing in the dietary community. However examining a food's nutrient contribution and whether it is nutrient-rich or nutrient-poor is more important than evaluating food processing alone.

Calcium is an under-consumed nutrient across the globe and dairy foods are the number one source of calcium in the food supply.

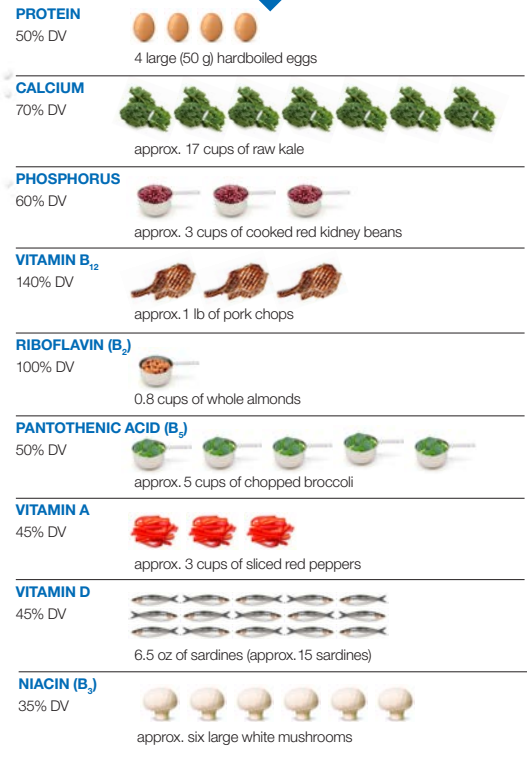
Dairy foods offer a unique nutrient package that is difficult to replace with alternative sources. The 2010 U.S. Dietary Guidelines Advisory Committee (DGAC) scientific report illustrated that an individual would need to eat unconventionally large amounts of other foods which would result in significant calorie increases with unknown nutrient bioavailability from those foods in

Three Servings of Milk Deliver A Unique Nutrient Package

The Dietary Guidelines for Americans recommends three servings of dairy products each day.*



Milk's essential nutrients can be difficult to replace in a healthy dietary pattern. Three 8-ounce cups provide as much of each nutrient as:



*The 2015-2020 Dietary Guidelines for Americans recommends three servings of low-fat or fat-free dairy foods (milk, cheese, yogurt) for Americans 9 years and older.

Source: U.S. Department of Agriculture Research Service, Nutrient Data Laboratory, USDA National Nutrient Database for Standard Reference Legacy Release, April 2018. Calculations based on low-fat milk (USDA database #01082). Some milk may be a good source of selenium and/ or zinc. Other foods used: large egg (50 g), whole, cooked, hardboiled (#01129); kale, raw (#11233); beans, kidney, California red, mature seeds, cooked, boiled without salt (#16031); pork, fresh, loin, sirloin (chops), bone-in, separable, lean only, cooked, broiled (#110058); nuts, almonds, whole (#12061); peppers, sweet, red, raw, sliced (#11821); broccoli, raw, chopped (#11090); fish, sardine, Atlantic, canned in oil, drained solids with bone (#15088); mushrooms, large, white, raw (#11260).

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Available from: <https://www.usdairy.com/news-articles/three-servings-of-milk-deliver-a-unique-nutrient-package>

order to replace the nutrients readily available in dairy foods with other sources.ⁱⁱⁱ Similar findings were reported in a study published in *Public Health Nutrition*. Researchers examined the impact of trying to replace the nutrients in dairy foods with other food options and found that not only would individuals have to consume significantly more calories overall, but that the food would be more expensive than dairy foods as well.^{iv}

Many countries across Latin American and the Caribbean do not classify dairy in its own food group,

rather it is grouped with meat, seafood and eggs in a category called “Food From Animals”. This is likely the result of FAO guidance advising food from animals be used as a category for food based dietary guidelines in the Caribbean.^v Most countries in the region recommend daily dairy consumption, but the amount recommended varies. In the U.S. there are three recommended dietary patterns and dairy foods are recommended for daily consumption in all three. Two of the patterns recommend three cups of low-fat and fat-free dairy per day and the third pattern recommends

two cups per day, but it should be noted that this dietary pattern falls short on providing recommended calcium intake.

Dairy foods are foundational for these healthy eating patterns and are recognized as important for reducing the risk of chronic diseases like cardiovascular disease, high blood pressure and type 2 diabetes as well as improving bone health, especially in children and adolescents.^{vi} Adequate consumption of dairy foods could also contribute to a significant reduction in healthcare spending. Researchers created statistical models to examine dairy consumption compared to rates of chronic diseases that are known to decrease with increased dairy consumption and found that annual healthcare cost savings could equal \$12.5 billion if Americans consumed simply the recommended amount of dairy per day.^{vii}

As sustainability considerations impact development of food-based dietary guidelines, a shift toward a greater focus on plant-based foods is taking place. This transition is happening even though there are inconsistent definitions for what plant-based means and how to implement such a diet globally. As a result, dairy recommendations are decreasing in dietary guidance across the globe. The U.K.'s 2016 EatWell Guide included no specific serving amount for dairy, but it decreased recommended calories from dairy foods from 15% to 8%. This translates from a decrease of 3 cups of milk to 1.5 – 2 cups of milk per day. In 2002 and 2011 dietary guidance in France recommended 3 daily servings of dairy. However, recently, Public Health France published new recommendations that advised only 2 servings of dairy per day. These decreases in dairy may lead to nutrient deficiencies or increased food costs to obtain nutritionally adequate diets.



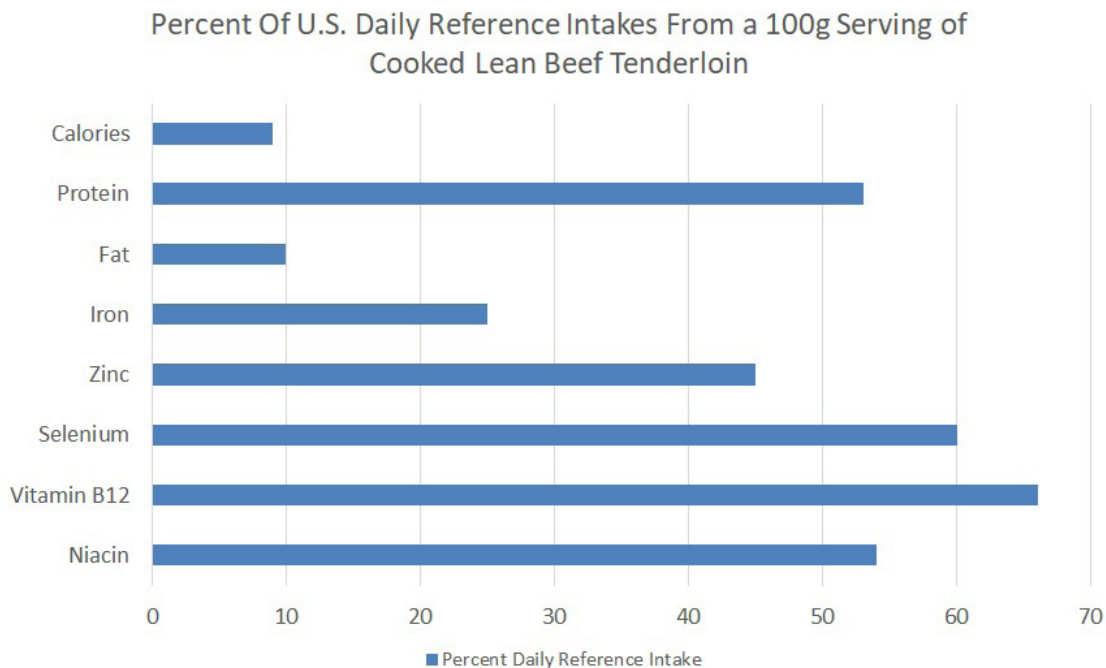
Nutritional Benefits of Meat & Common Misconceptions

Similar to dairy foods, meat provides important essential macro- and micro-nutrients. Meat provides 23 grams of protein per three ounce serving which is more protein than other protein foods per comparable serving size. Meat also provides important micronutrients such as vitamin B12, iron, zinc, selenium and niacin. A 100g serving, or slightly less than 4 ounces, of lean beef tenderloin provides more than 50% of the U.S. Daily Reference Intake (DRI) for protein but less than 10% of the DRI for calories. This nutrient-dense portion also provides 50% or more of the DRI for selenium, vitamin B12 and niacin.^{viii}

Not all protein foods are created equal. Protein in foods contain amino acids and these can be divided into non-essential, which the human body can produce, and essential amino acids, which must be supplied by

foods. Failure to obtain enough of even 1 of the 10 essential amino acids can result in protein degradation and other metabolic challenges. Plant-based proteins do not compare with animal-sourced protein as it relates to amino acid profiles because many plant-based proteins do not provide all the essential amino acids like meat does. Additionally, it would take considerably more plant-based protein by weight to provide a similar amount of certain amino acids. One study found that 6.2 grams of soy protein would be needed to provide the same amount of lysine that could be provided by 1 gram of protein from beef or 1.6 grams of protein from cow's

Plant-based proteins do not compare with animal-sourced protein as it relates to amino acid profiles because many plant-based proteins do not provide all the essential amino acids like meat does.



milk.^{ix} This further supports the previously discussed idea that significantly more food and calories would need to be consumed to achieve adequate nutrient consumption if dietary recommendations shift toward a more plant-based approach.

Despite these benefits, meat and meat products have been criticized for their association with chronic diseases. When examining the related evidence of these claims, it is important to take into consideration the totality of the science. In 2018 the WHO International Agency for Research on Cancer (IARC) published their monograph on red meat and processed meat. This report concluded that processed meat was a cause of colorectal cancer and red meat is a probable carcinogen.^x Further examination of the research used to compile the report reveals weaknesses in the IARC analysis. These weaknesses include relatively low statistical magnitude, unreliability based on self-reported dietary and lifestyle information, data confounded by lifestyle behaviors and clinical factors, as well as inconsistent definitions of processed meat. Of the 23 cohort studies examined in the IARC report, only approximately 10% of the 174 total relative risks were statistically significant and only 5.7% had a relative risk over 2.0. This means the majority of the relative risks included confounding factors that make it difficult to distinguish causation. Additionally, 28.7% of the 174 relative risks examined were below 1.0 which is actually indicative of a protective effect of the variable; meaning meat consumption actually helped improve the outcome examined.

Another common misconception related to cured meats is that they are the leading dietary source of nitrites and nitrates. Although they provide numerous health benefits, some research indicates that nitrates and nitrites have carcinogenic effects. Interestingly only 5% of nitrite in the diet comes from cured meats while 93% comes from human saliva and vegetables including celery, beets, green beans and leafy greens. Nitrates,



often derived from natural sources, are added to meat products in order to enhance food safety and extend shelf life of a meat product which is very important in the context of food security and reducing food waste.

Looking Ahead

Two major developments with implications for global food systems will take place in 2021. The UN Committee on World Food Security's Voluntary Guidelines on Food Systems and Nutrition will be released in February and the UN Food Systems Summit will be hosted later in the year. It is important that a holistic approach accounting for the intersections and trade-offs across multiple domains of sustainability are addressed in both of these. Broad collaborations and coordinated efforts with all stakeholders in the livestock industry are required to ensure that the industry is represented in the ongoing

It is also imperative that the industry participates in thought leadership opportunities and continues to engage with diverse audiences to build and foster relationships and engage in idea-sharing.

dialog about sustainable food systems. This includes promoting the strong body of existing science supporting the health benefits of animal-based foods as well as continuing to support new science. It is also imperative

that the industry participates in thought leadership opportunities and continues to engage with diverse audiences to build and foster relationships and engage in idea-sharing.

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The Importance of Science-Based Animal Care



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The relationship between humans and animals is very complex and includes interactions such as companionship, utility, education, research and food production. Animal care plays a critical role in how humans interact with animals across all these different relationships. In the livestock industry, good animal care is of the utmost importance to farmers. Farmers across the globe take a great deal of pride in the level of animal care they provide because good animal care not only enhances the quality of life for livestock animals, but it also supports strong business outcomes. Science-based animal care is also a critical pathway to a sustainably viable, responsible and ethical livestock industry.

Animal Welfare Science

The field of animal welfare science has seen tremendous growth in recent decades and evidence from this field can inform data-driven strategies to enhance the industry. Animal welfare science has emerged into a multidisciplinary and interdisciplinary field that encompasses sciences including behavior, physiology, pathology, immunology, neurobiology and genetics. The goal of this multidisciplinary field is to generate knowledge regarding the quality of life and welfare of livestock animals and how it can be improved within real world scenarios. This data can also inform consumers who want to know where their food comes from and how it is made.

As the body of evidence in animal welfare science has grown, so have expectations from society regarding animal welfare. There has been an increase in animal welfare regulations in certain countries and regions. Additionally, there has been an increase in animal welfare certification and labeling programs throughout the supply chain, including retailers and food service organizations. Although there is more scientific data than ever regarding animal health, some animal welfare regulations and certifications are based on general misinformation, pseudoscience or cherry-picked data rather than examining the totality of evidence. As such, it is important that animal care programs and guidelines



are based on a solid scientific foundation and that the industry leans on experts to translate the research for farmers and into farm-based applications.

The global research sector, where animals help scientists understand outcomes that impact society, is a good example of science-based animal care and use programs that were created from a data-driven model and are continuously reviewed with oversight controls.ⁱ These programs not only define and control all aspects of animal care in the research setting, but they also aid in the reproducibility and validity of animal-based research outcomes. In addition to animal care programs, legal frameworks and professional organizations also exist in many geographical areas to monitor and enhance animal care standards. Similarly, animal care programs in the livestock production sector must have a strong scientific foundation as well.

Scientific data provides an objective starting point for dialog regarding animal health, especially when perceptions about animal health differ between regions, cultures and are also species-specific.^{ii,iii} Science can help the industry better understand real-world factors that affect complex animal welfare issues by establishing controlled settings to examine current or novel livestock practices.^{iv} Science also provides insights about animals that cannot verbalize what they need and is a critical part of the ethical and moral obligations of human caretakers.

Research outcomes from animal welfare science impact all levels of the livestock industry, from the regulatory

It is important that animal care programs and guidelines are based on a solid scientific foundation and that the industry leans on experts to translate the research for farmers and into farm-based applications.

It is important to translate science and evidence into practice at the farm level to benefit both humans and animals.



and veterinary community, to the work of caretakers on farms. It is important to translate science and evidence into practice at the farm level to benefit both humans and animals. One way this is done is through the creation of standards and guidelines meant to inform and enable implementation of scientifically-based best management practices. An example of this can be seen through the work of the World Organization for Animal Health (OIE), which is an intergovernmental organization that is responsible for setting animal health standards worldwide. The OIE was founded in 1924 and has a strong global network of scientific experts that regularly convene subject-matter experts to develop international standards. These standards “must have a solid scientific basis, must involve wide engagement of all stakeholders, must ensure a holistic view of the systems within which animals are kept and used by humans, and must aim to have a tangible impact of animal welfare.”^v Standards also exist within regions and sectors of the livestock industry. In the US, for example, independent guidelines and handbooks exist for the dairy, pork, egg and red meat industries. These guidelines serve as training and educational tools to implement science into practice at the farm-level.

Value to Producers

There are numerous examples of scientific data supporting the relationship between animal care and productivity. For instance, an examination of different light intensities in poultry production revealed the impact of light on behavior, health, stress and growth in broiler chickens.^{vi} Research regarding the complexities of human-animal interactions found that caretakers with positive attitudes and behaviors enhanced productivity in cows, chickens and pigs.^{vii} And, at the broadest level, science can reveal persuasive statistics about the impacts of healthy animals and sustainability. The OIE estimates that 20% of animal production worldwide is lost as a result of disease alone.^{viii} If farmers worldwide

If farmers worldwide adopt the most basic aspects of scientifically-sound animal care programs to prevent or control disease, this will lead to more sustainable herd productivity, meet the demands of concerned consumers, and translate into economic benefits for producers.

adopt the most basic aspects of scientifically-sound animal care programs to prevent or control disease, this will lead to more sustainable herd productivity, meet the demands of concerned consumers, and translate into economic benefits for producers.

Farmers take pride in achieving an excellent herd health status. Promoting herd health should be an aspiration for every livestock farming business because the impact of livestock diseases can be severe. Research dating back to the early 1900's has shown that a farm's economic viability can be severely impacted by livestock diseases. Disease outbreaks can lead to increased mortality rates, decreased productivity, decreased fertility rates, increased stillbirth incidence, and decreases in the quality of animals' meat, milk and eggs.



The economic consequences of disease outbreaks also include increased veterinary intervention costs, decreased market value of food, losses in trade and food insecurity.^{ix, x} There are also larger scale implications of disease outbreaks that can result in animal depopulation, trade halts, the need for disease eradication efforts, human health implications and agricultural economy instability.^{xi}

Scientific Evidence in Practice

Putting scientific evidence into practice in livestock operations yields improvements in animal care outcomes and can also enhance relationships with retailers, restaurants and consumers. For example, the North American Meat Institute (NAMI) has utilized scientifically-based handling guidelines, coupled with strategic monitoring programs, and seen significant improvements in the meat packing industry. In 1991, NAMI partnered with world-renowned animal welfare expert Dr. Temple Grandin to create guidelines for livestock handling and effective, humane stunning. From 1991 to 1996, Dr. Grandin conducted plant audits to examine how well the guidelines were being utilized, which resulted in the development of a plant audit tool to objectively measure implementation by plant workers in 1997. This process yielded an audit program that plants continue to utilize today to conduct self-assessments and is embraced by restaurants and retailers, many of whom require specific animal welfare standards.

Continuous improvement is a critical component to any successful animal care program, including monitoring and verifying that science-based practices are being consistently followed over time. Everyone involved in the livestock industry needs to have a mindset of continuous improvement because improving animal care is a continuous process. Animals, like humans, are complex and there is no finite endpoint to the scope of animal care. Genetics, farming practices and environmental

Continuous improvement is a critical component to any successful animal care program, including monitoring and verifying that science-based practices are being consistently followed over time.

conditions are evolving, and societal expectations and the regulatory world are changing as well. Good animal care requires new approaches throughout each animal's life and a mindset of continuous improvement prevents stagnation. The responsibility of continuous improvement does not fall solely on farmers or ranchers, but also throughout the supply chain, including everyone

interacting with animals, accessing animal products, and regulating how food is produced.

In order to be a sustainably viable, responsible and ethical industry, farmers and the entire livestock supply chain need to embrace data-driven evidence to make informed decisions when creating animal care standards. It is also important to uphold science as the backbone of continuous improvement in animal care programs in order to measure the effectiveness of changes and any progress made. The animal agriculture industry needs to take an active role in finding the balance between technical and biological understanding of good animal care along with participating in the ongoing dialog regarding social and ethical expectations. A strong scientific foundation will enable the industry to transparently participate in this dialog with both scientific and ethical justifications.

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Sustainability Feeding the World



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Tyson Foods is a multi-national, protein-focused food company that produces approximately 20% of the beef, pork and chicken in the US. Founded in 1931, Tyson began as a transportation company bringing chickens from Northwest Arkansas to Chicago for the live market and is now ranked #1 in *Fortune Magazine's* "World's Most Admired Companies" in the food category. Tyson was primarily associated with chicken products, but in 2020 the beef portfolio was the largest segment of its business.

Consumers demand more transparency in food production than ever before and expect readily available information regarding where and how food is produced as part of a premium food experience.

On an annual basis, Tyson brings approximately 2 billion chickens and 6 million cattle to harvest each year. Tyson is committed to helping solve the challenge of feeding a growing world population which will grow by 2.5 billion people over the next 30 years. Protein is an essential nutrient so the demand for sustainably produced protein sources will continue to be great.

Sustainability isn't new at Tyson Foods, but it became part of the formal enterprise strategy in 2017. In order to develop this strategy, Tyson examined consumer insights as well as environmental and social impacts. Consumers demand more transparency in food production than ever before and expect readily available information regarding where and how food is produced as part of a premium food experience. Premium food experiences were once an occasional luxury, but consumers now desire premium for everyday occasions.¹



Sustainability influences consumer purchasing decisions with criteria such as humane treatment of animals, safe working conditions, reduced waste and pollution along with philanthropic community outreach.ⁱⁱ

The strategic implementation of sustainability at Tyson Foods takes many shapes across the business. The first sustainability pillar supports people in the communities where help is needed most including both Tyson employees and the general public. The Upward Academy initiative offers and financially supports team members' enrollment in courses such as English as a second language (ESL) as well as financial and digital literacy. Additionally, over the past 12 months, Tyson has donated \$30 million in-cash or in-kind contributions to fight hunger which translates to roughly 120 million servings of food relief. The second pillar focuses on the environment including publicly stated targets for reductions in water intensity and GHG emissions as well as verified

improved sustainable land stewardship practices. Since 2016, Tyson has reduced water use by 1.4 billion gallons annually and continues to work toward a goal to reduce water use intensity by 12% across the business. Tyson worked with the World Resources Institute (WRI) to develop science-based GHG targets and aims to achieve a 30% reduction in GHG emissions by 2030. The third sustainability pillar is animal welfare and involves not only improvements in animal welfare indicators, but also transparently communicating animal care audits. Tyson strives to be a leader in animal experience research and innovation and has implemented numerous solutions to improve animal health and welfare which ultimately supports improved production and performance. Examples of these efforts include: identifying opportunities to improve the lives of animals in the supply chain at facilities or during transport, alternative feeding trials to mitigate the need for antibiotics, and improved lighting and flooring systems to promote health.

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Research & Innovation to Support Sustainable Production



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Introduction

Research and innovation are changing the narrative regarding sustainability in the livestock industry. GHG emissions and their impact on global warming, particularly methane, are often at the top of the list when it comes to environmental impact of livestock operations. A better understanding of how methane behaves in the atmosphere and how it compares to other greenhouse gases has given researchers new information regarding the overall impact of methane on global warming. Additionally, research is also identifying innovative ways to capture and reuse methane at livestock operations to reduce emissions overall. However, GHG emissions and air quality are not the only areas where research and innovation are leading to solutions that support sustainability in the industry. Gene editing and genetic research are finding ways to help animals be more resistant to diseases that cause animals to suffer and utilize excess resources. Additionally, innovations in the animal feed industry are creating solutions that reduce waste while delivering ideal nutrition and supporting optimal growth.

Rethinking Methane

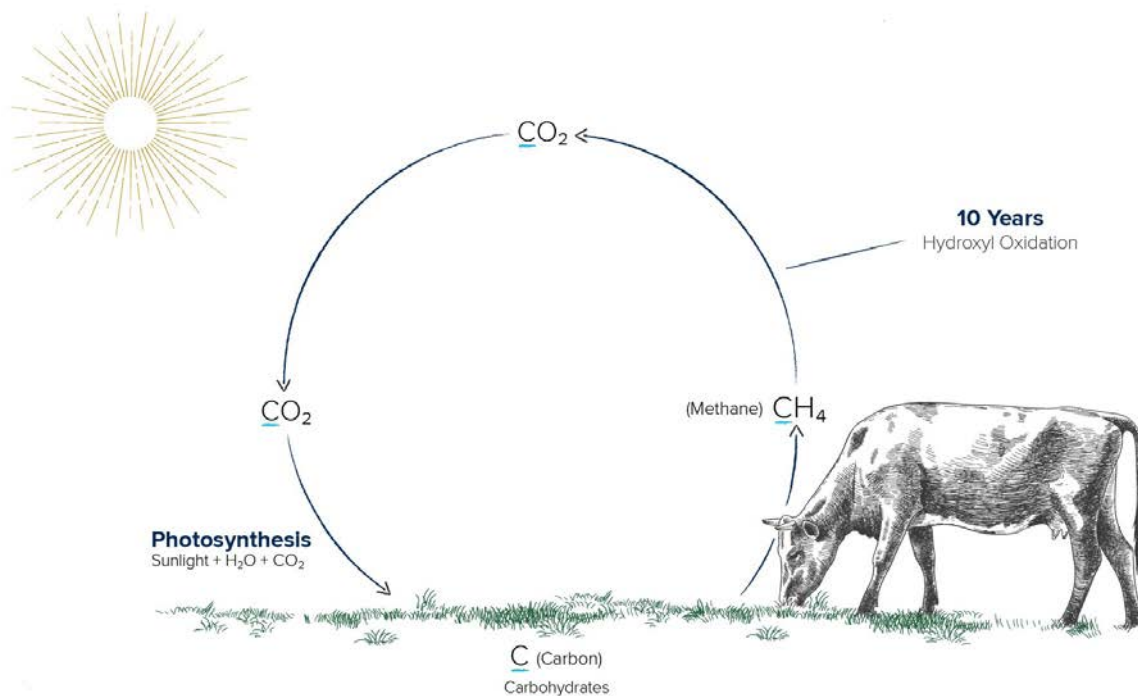
Methane is a GHG and, like other GHGs such as carbon dioxide and nitrous oxide, has the potential to trap the sun's heat in the atmosphere. The global warming potential of different gases are compared to one another using a metric called GWP_{100} . GWP_{100} converts the potency of different gases to that of carbon dioxide by a multiplying factor respective to the gas being evaluated. GWP_{100} has been used over the last several decades, but this doesn't fully represent methane's warming impact when emissions are increasing, decreasing or remaining constant. While it is true methane is a potent GHG, its shorter half-life than other GHGs should be fully considered when determining its global warming potential. Because methane is broken down in the atmosphere almost as quickly as it is

produced, how the pollutant warms should be based on the rate of emission, or how much more or less is being emitted from a source. This shouldn't negate the warming already produced by a source, but provide an accurate assessment of how current emissions are further impacting the climate.

The lifespan of a GHG is measured by its half-life. Carbon dioxide has a half-life of 1,000 years and nitrous oxide has a half-life of 110 years. These are both called long-lived climate pollutants. Methane has a half-life of roughly 10 years and, although it is still a potent GHG, it is a short-lived climate pollutant. The half-life of methane is significantly shorter than other GHGs due to a process called hydroxyl oxidation. This atmospheric reaction occurs when methane combines with another molecule called a radical which removes hydrogen from the methane molecule resulting in the conversion to carbon dioxide and water vapor. However, methane from ruminant animals has further considerations. Oxidation is a critical part of an additional process called the biogenic carbon cycle.

The biogenic carbon cycle begins with the process of photosynthesis. During photosynthesis, green plants use sunlight to synthesize cellulose and starch from atmospheric carbon dioxide and water. Ruminant animals eat the cellulose and, during digestion, release methane into the atmosphere via belching and manure. Once the methane is in the atmosphere, it will

Livestock herds that remain the same size will not add new additional carbon to the atmosphere over a period of time; the methane from a livestock herd that remains constant in size will have near a neutral warming impact on current climate temperatures.



undergo hydroxyl oxidation over the course of methane’s 10-year half-life. So, while livestock do release carbon-containing methane, the carbon is not newly created. It is recycled carbon that came from atmospheric carbon dioxide used in photosynthesis. As a result of this process, livestock herds that remain the same size will not add new additional carbon to the atmosphere over a period of time; the methane from a livestock herd that remains constant in size will have near a neutral warming impact on current climate temperatures.

Livestock Methane vs. Fossil Fuels

On a global scale, methane is released into the atmosphere at a rate of approximately 560 teragrams per year. The sources of this methane include fossil fuel production and use, agriculture and waste, biomass burning, wetlands and other natural emissions. However, due to hydroxyl oxidation, methane is also simultaneously destroyed at a rate of 550 teragrams per year.

In the United States, and in most developed countries, more than 80% of all GHGs originate from fossil fuels while only approximately 4% originates from livestock. For this reason, it is critical to examine the significant differences between fossil fuel emissions and livestock methane. Hundreds of millions of years ago plants and animals died and decomposed and the carbon from these species was locked deep inside the earth and transformed into oil, coal and gas over a long period of time. During the last 70 years, this carbon-containing material has been extracted from the earth and burned as fossil fuels with carbon dioxide emissions releasing additional carbon into the atmosphere that had been locked away inside the earth. As a result, fossil fuels are

In the United States, and in most developed countries, more than 80% of all GHGs originate from fossil fuels while only approximately 4% originates from livestock.

the main culprit of human caused GHG emissions and a significant driver of climate change.

Carbon dioxide is called a stock gas. As previously mentioned, it has a half-life of 1,000 years meaning it takes a very long time to break down. As it is emitted into the air it adds additional carbon dioxide and accumulates over time creating a stockpile because it stays in the environment. Methane, on the other hand, is called a flow gas and this is due to its

relatively shorter half-life of 10 years and the hydroxyl oxidation process. A flow gas stays constant in the atmosphere because it is destroyed at relatively the same rate of emission.¹ In the livestock industry, new methane will only be added to the atmosphere in the first 10 years a farm or ranch is in existence so long as the herd remains constant in size. After the first 10 years, because of hydroxyl oxidation of methane, the amount of methane produced and the amount of methane destroyed will have balanced each other



out. It's important to consider the amount of warming already generated by herds and more important not generate further warming.

A New Way to Measure Methane

Since carbon dioxide and methane behave so differently in the atmosphere, applying the GWP_{100} metric to compare emissions of the two distinct GHGs misrepresents the impact of short-lived climate pollutants and should change so that we can accurately assess climate impacts and act appropriately. Researchers at Oxford University developed a new metric called GWP^* that uses GWP_{100} as a base, but also takes into account how methane changes over time. Using this metric they demonstrated how methane emissions impact atmospheric carbon

dioxide under three conditions over 30 years: a scenario where methane emissions increase by 35%, a scenario where methane emissions decrease slightly by 10% and a scenario where methane emissions decrease significantly by 35%. In the real world, an increase in methane would result from new or increasing herd sizes and a decrease in methane would result from mitigation factors such as feed additives or anaerobic digesters.

In the model, the Oxford researchers first examined the three methane emission levels using GWP_{100} and found that all three resulted in a significant increase of carbon dioxide equivalents as if methane were an accumulating stock gas. Using GWP^* , the researchers found that increasing methane emissions by 35% over 30 years was associated with a significant increase in carbon dioxide equivalent emissions. A slight reduction in methane





emissions of 10% percent over 30 years resulted in no additional carbon dioxide equivalents and perhaps even a reduction. The scenario where methane emissions decreased by 35% over 30 years resulted in a drastic reduction in carbon dioxide equivalents, a scenario in which the hydroxyl oxidation process is actively pulling carbon out of the atmosphere and positively contributing to cooling the atmosphere.ⁱⁱ Additional modeling of changing carbon dioxide and methane emissions similarly showed how rising, constant and falling emissions of both gases

would impact the atmosphere and the negative warming potential of falling methane emissions over time.ⁱⁱⁱ

Using technology such as bovine bubbles, wind tunnels, flux towers and head chambers, UC Davis researchers can measure methane emissions from belching and manure at livestock operations. This allows them to examine the impact of various interventions such as feed additives and measure the impact on methane emissions. Researchers are working to identify the most impactful interventions to reduce methane emissions in order to improve air quality. In California, legislation and financial incentives are supporting the state's livestock industry to implement innovative technologies to reduce methane emissions. A new law mandates a 40% reduction of methane by the industry by 2030 and \$500 million dollars has been set aside to provide financial credits to farmers who implement changes to reduce methane emissions. Many dairy operations have installed covered lagoons that capture biogas emissions from manure. The biogas is then converted into renewable natural gas (RNG) and the RNG is used to fuel vehicle fleets. Since 2015, methane emissions have been reduced by 2.2 million metric tons annually which equates to a 25% reduction achieved annually and more than halfway to the goal of a 40% reduction by 2030. This significant progress is an example from just one state, but demonstrates not only how the sector can help decrease GHG emissions, but also help provide broader solutions to the climate issues at hand.

Harnessing Technology in Livestock Production

As a part of the global effort to ensure sustainability of animal protein production, innovation in genetics to reduce and eliminate animal disease is critical. Even when the very best animal care practices are instituted, livestock can still get sick and animal diseases do not discriminate between various types of production facilities.



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The ripple effect of a disease outbreak impacts all stakeholders in the food chain from the animals themselves, to the farmer, to the consumer, the food companies and the environment. Utilizing genetic technology to prevent animal disease can minimize animal suffering as well as the economic impact of additional veterinary intervention or loss of animals. It can also help support consumer confidence in the safety of animal protein as well as improve affordability. Healthy animals mean fewer environmental concerns about additional waste and antibiotic use as well.

History shows how selective breeding and the resulting superior genetics have led to more sustainable animal protein production with farmers producing much more

with fewer animals overall. Over the last 70 years, the dairy industry is now producing 60% more milk with 60% fewer cows. In the time period from 1993 to 2013, milk production has grown 1.1% annually, but herd sizes have gotten smaller. In the same time period, piglet litter size increased nearly 100% with an annual growth rate of 3.7%. Meat production increased by 80% per sow while feed requirements decreased. In beef cattle, the amount of feed necessary to gain one kilogram of weight dropped 10% between 1993 and 2013.^{iv}

Genus is a world-leading animal genetics company that has been developing cows and pigs with desirable traits to improve productivity and disease resistance for more than 85 years. Genus applies genomic science, new animal breeding techniques and advanced reproductive biology technologies to develop proprietary breeding programs. These programs can break the chain of transmission making animals less susceptible to a variety of diseases helping animals lead healthier lives and preventing the previously discussed ripple effect through the food chain.

The Power of Gene Editing to Prevent Disease

Gene editing is a technology that allows genetic material to be added, removed or altered at particular locations in the genome. This technology is used in a number of ways in many industries, but one example from Genus utilizes gene editing to prevent a virus called Porcine Reproductive and Respiratory Syndrome (PRRS). PRRS cannot be effectively prevented or eliminated using traditional veterinary medicines and it causes animal suffering and death as well as the loss of millions of dollars. In 2011, researchers estimated US pork producers lose more than \$600 million US a year due to PRRS and in Europe losses are closer to \$1.5 billion € every year.^v Pork production in Europe is roughly double the production in the US and PRRS is an endemic disease, which impacts herds even in strictest biosecurity environments.

New breeding approaches, like gene editing, have the potential to play an important role in minimizing animal sickness to improve the sustainability of agriculture and eliminate disease.

New breeding approaches, like gene editing, have the potential to play an important role in minimizing animal sickness to improve the sustainability of agriculture and eliminate disease. As part of their efforts, Genus adheres to a set of ethical commitments and guidelines with the priority of animal welfare and food safety. These ethical commitments and guidelines include ensuring transparency, prioritize human health first while also improving the lives of animals, comply with regulatory guidance, mandate monitoring for



unintended consequences, improve environmental stewardship and involve third party validation to certify testing and results. Genus is committed to never adding DNA from foreign species, creating so-called designer animals or utilizing the technology to enable animals to withstand harsh conditions that would allow for abuse. The Genus approach focuses on turning off genes that create disease susceptibility and on making animals healthier. The path from investigation to commercialization of PRRS resistant pigs is ongoing as Genus seeks US Food and Drug Administration (FDA), as well as other key international pork and pork trade markets for approval of this technology. Three important areas on the pathway to technology acceptance include government review, an aligned global food system and consumer acceptance. All of these require open communication and transparency with all stakeholders.

Animal Nutrition and Livestock Efficiency

As the world population grows and population density shifts from rural to urban areas, the demand on agriculture to be more efficient increases. One example of this efficiency at work is in Brazil where the evolution of pasture area and productivity of beef cattle has changed rapidly over the last 30 years. Since 1990 pasture area for beef cattle has been reduced by 15%, but productivity, measured by tons of meat produced, has increased by 169%.^{vi} According to FAO one in ten people worldwide do not have access to sufficient food to achieve their energy and nutrient needs while at the same time one third of all food produced for human consumption is wasted.^{vii, viii} Both of these factors are further evidence that greater efficiency in food production is necessary to both feed the population and to reduce food waste. Not only will greater efficiency in food production help address these issues, as well as many others, but it will also support a more sustainable food system.

Reducing production variability is an opportunity for increased sustainability.

Feed conversion rate (FCR) is a calculation that measures the efficiency with which livestock animals convert feed into the desired output such as meat, eggs or milk. An examination of one poultry production facility in Brazil showed a FCR range of 1.42 to 1.62 over a three-year period. If this data is extrapolated to worldwide poultry production, it is estimated that an improvement in the FCR of just 0.01 could reduce global feed consumption by 1.4 million tons. Reducing production variability is an opportunity for increased sustainability.





There are many complex variables that impact FCR such as modernization of farm structure. In a Cargill comparison of conventional to tunnel chicken houses, analysis showed that the chickens produced in more modern tunnel houses demonstrated a 150 gram better FCR than those produced in conventional houses. Automation and robotization of farm operations is already being used and will continue to evolve to aid

in monitoring animal wellbeing and needs, including feed consumed, temperature, water consumption and animal weight among others. Artificial intelligence can help reduce production variability by tracking and aggregating the variables in ways that humans cannot.

Real-time production monitoring is another important aspect to achieve greater efficiency in animal nutrition. Real-time metrics allow farmers to operate with a smaller safety margin between nutrient requirements of animals and nutrient availability from feed. A narrower safety margin results in less consumption, less excretion and less water usage. The Cargill Near-Infra-Red Reflectance (NIR) technology is a tool that enables this real-time decision making. For example, crude protein content of soybean meal has natural variability. As an example, antitrypsin, a component of soybean meal, can negatively affect digestibility of amino acids in the feed at certain levels which would negatively impact weight



gain and FCR. Portable NIR technology can tell farmers in real-time about the composition of the feed they are using which enables them to make more informed decisions about how much food to offer and other variables of the animal environment to adjust. Another Cargill technology called the MAXINIR is an in-line feed formulation adjuster that is attached directly to animal feed dispensers on the farm. Every 20 seconds the NIR measures and adjusts feed formulation to improve FCR and decrease waste.

While all of these technological advancements will help the industry become more efficient and sustainable, training of farm staff remains a critical component to ensure individuals understand how to put practices into place. Cargill data shows that, at the farm, nearly 23% of the variability in body weight of poultry can be attributed to differences between producers and nearly 5% can be attributed to technicians. Technology will be most effective with comprehensive training and compliance.

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The Interconnection of Economic Growth & Livestock Sustainability



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The 2030 Agenda for Sustainable Development established 17 SDGs that aim to end poverty and numerous inequalities while spurring economic growth and protecting the planet. Each of the goals has a unique target outcome, but the goals and related strategies must go hand-in-hand and build on one another. There are a number of factors that contribute to the ability to achieve progress with each of the SDGs. For example, to achieve a world without poverty (SDG 1), it is crucial to assure food security and nutrition (SDG2) and foster decent work and economic growth (SDG 8). Good jobs are necessary to allow access to food, housing, health, education and wellbeing (SDGs 2 & 3), but those jobs cannot exist without focusing on industry, innovation and infrastructure (SDG 9). Although the livestock industry has been criticized for its environmental impacts, it is quite relevant to consider how to promote sustainable livestock, reduce emissions, recover pastures, enhance productivity, adopt innovation and foster animal welfare practices while making significant contributions to food security and providing millions of jobs. The livestock industry is a cultural backbone of many people's lives in different countries and to achieve the SDGs it is fundamentally important to foster its improvement towards building consistent positive changes.

The Important Role of Animal Protein

Animal protein from meat, milk, eggs and fish provides a unique nutrient profile compared to plant protein. For this reason, animal proteins are termed high-quality protein because they supply all of the amino acids necessary for human growth while vegetable proteins lack at least 1 or more of the 10 essential amino acids. While the environmental impact of food sources is one factor to consider, it is also important to compare the cost of diets that rely on each source of protein. A common misconception is that relying solely on plant protein to meet nutrition needs is both affordable and sustainable.

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A recent evaluation of food cost data demonstrated that the monthly cost of achieving the recommended protein intake is actually often lower when utilizing animal protein sources than plant proteins. Depending on the country of reference, meeting protein needs using chicken or pork ranged from \$15.90 to \$61.70 US per month, while meeting similar needs with plant proteins such as soybeans, lentils or peas ranged from \$48 to \$270 US, which is approximately 3-5 times more.ⁱ

There is also a correlation between per capita consumption of animal protein and hunger index. Analysis shows that countries with smaller per capita consumption of animal protein are those that also have a larger hunger index.ⁱⁱ There are, of course, a number of factors that contribute to animal protein consumption statistics including cultural preferences, access, production and imports, but these factors do not negate the important role that animal protein plays in human health and the vital nutrients it provides, especially to individuals in countries where hunger is a major concern.

Brazilian Beef Agroindustrial System

Brazil is the world's second-largest beef producing country with 162.5 million hectares of pasture land and 213.7 million head of cattle.ⁱⁱⁱ In 2019, the industry made nearly \$160 billion US with a total retail revenue of \$49.3 billion US.^{iv} There are approximately 5 million farmers in Brazil, 3.8 million of which are small family farms while 1.1 million are large operations. These larger operations, however, operate on nearly 77 percent of the agricultural area in Brazil.^v



The vast value chain of this industry and its many stakeholders including farmers, ranchers, slaughterhouses and retailers are responsible for numerous jobs and livelihoods. While much of the beef is destined for the domestic market, fresh and processed products are sold as exports in more than 100 countries supporting food

Smaller family farms do not have the same resources, technology and access to credit that larger operations have and this has implications for both sustainability and job security.

security worldwide. The evolution of pasture productivity since 1990 has seen considerable changes with a decrease of nearly 30 million hectares of total pasture land in use for beef production while productivity rose 169%.^{vi} This is changing the narrative regarding sustainability while preserving important jobs. Smaller family farms do not have the same resources, technology and access to credit that larger operations have and this has implications for both sustainability and job security.

In 2010 Brazil approved the National Plan for Low Carbon Emissions in Agriculture (ABC Plan). This plan offers incentives such as providing lines of credit for farmers who adopt sustainable agriculture practices including no-till agriculture, restoration of degraded pasture, planting of

commercial forests, biological nitrogen fixation, treatment of animal waste and integrated crop-livestock-forest systems. From 2010 to 2018 10.44 million hectares of pastures were recovered and 32.88 million hectares of no-till lands as well as 12.61 million hectares of integrated crop-livestock-forestry systems were established.^{vii, viii} Targets for the next phase of the plan from 2021-2030 are now being established. Similar targets are also part of Brazil's Nationally Determined Contributions (NDCs) as part of the global Paris Agreement.

Critics often attribute increasing Amazon deforestation rates solely to agricultural expansion, but that is not accurate. While agricultural expansion is one cause of deforestation on private lands and in rural settlements, deforestation also occurs in non-designated public lands that are owned by the states as well as on indigenous land and in conservation units.^{ix} There are many smaller family farms operating in rural settlements that do not have access to resources or lines of credit to modernize their operations and adopt sustainability



practices, so increasing the footprint of their agricultural lands via deforestation becomes their only option to maintain jobs and income. Farmers outside of North America and the European Union would benefit from greater access to and availability of subsidies to implement sustainable farming practices that are more common in these regions.

Rather than looking at sustainability challenges as liabilities, the opportunity exists to view them as an asset

for innovation, job creation and economic growth. For example, pasture recovery and management will allow farmers to bring animals to market faster, increasing their productivity and reducing the need to seek additional pasture land. Supporting small scale producers via innovative financial mechanisms and access to credit is fundamentally important to protect jobs and livelihoods. Adoption of good sustainability practices themselves also create numerous opportunities for both specialized and non-specialized labor.

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International Trade in Animal Products: WTO SPS Agreement and International Standards



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The annual value of trade in agricultural products nearly tripled over the past decade. In 2018, the value of traded agricultural products was \$1,807 billion US and food accounted for almost 85 percent of that total.ⁱ In 2018, the value of live animals traded was \$23 billion US. \$128 billion US in meat and edible offal, as well as \$87 billion US in dairy products and eggs were traded.ⁱⁱ Over the past two decades, trade agreements have created reductions in tariffs at both the global and regional level, and this has expanded opportunities for global trade. However, in order to access international trade markets, producers must be able to meet international standards for food safety and animal health.

International standards play a critical role in trade as they help ensure safe, nutritious and sufficient food for a growing world population. Consumer confidence is bolstered by standards because the end-user is assured that the products they are purchasing are safe, authentic and of the expected quality. These same standards help governments guarantee food safety and ensure that quality and labeling requirements are met. International standards also provide a sound scientific and technical basis for measures and allow for a common understanding of food safety and animal health requirements. These standards facilitate producers' access to international markets, minimizing the need for producers to comply with different standards in different markets and reducing trade costs by making trade more transparent and efficient.ⁱⁱⁱ

The World Trade Organization (WTO) is the international organization dealing with the rules of trade between nations. WTO agreements, which are negotiated and

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agreed upon by member governments, aim to make trade stable, predictable and transparent, and help settle legal disputes when there are differences between trading partners. The Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement)^{iv} establishes a framework for the application of food safety, animal and plant health regulations in trade. This agreement allows countries to set their own standards, but clearly specifies that regulations must have a strong scientific underpinning. The SPS Agreement provides a framework of rules to guide the development, adoption and enforcement of SPS measures, but it also ensures that these measures do not act as unnecessary barriers to trade.

The WTO SPS Agreement works in tandem with three international standard-setting bodies. Two of these three are most relevant to the livestock industry: the Codex Alimentarius (Codex) and the OIE. Codex develops internationally adopted food standards and related text aimed at protecting consumers' health and ensuring fair practices in food trade. The SPS Agreement specifically recognizes Codex standards as the benchmark for standards in the food safety area. The OIE establishes science-based standards for animal health to guide international trade in animals and animal products. Similarly, the SPS Agreement recognizes OIE standards as the benchmark for animal health.

One of the core principles of the SPS Agreement is scientific justification.

One of the core principles of the SPS Agreement is scientific justification. The SPS Agreement strongly encourages governments to base their sanitary requirements on the international standards, guidelines or recommendations established by Codex and the OIE. However, in cases where a government needs to put in place a higher level of protection, these food

safety or animal health-related measures must be based on a risk assessment which takes into account the risk assessment techniques developed by the relevant international organizations. Science-based animal health or food safety measures must be applied only to the extent necessary to protect human or animal life or health, while also being consistent and the least trade restrictive. There are some cases where measures with insufficient scientific evidence may be put in place, such as emergencies, but in these cases the SPS Agreement specifies that these measures should be temporary and that governments must seek to obtain additional information to assess the risk, as well as review the measures within a reasonable period of time.

Another important principle of the SPS Agreement is transparency. Regulatory changes affect market access, so it is important that trading partners and governments are made aware of any new or revised requirements so that access to the markets of trading partners is not interrupted. Advanced warnings and transparency enhance clarity and predictability in the trading system and also improve accountability and responsiveness of the regulatory system. Under the SPS Agreement, governments are obligated to notify the WTO of any new or revised food safety and animal health measures which impact trade. This is done by a National Notification Authority designated by each government. Another transparency-related obligation is the publication of SPS regulations, as well as the establishment of a



National Enquiry Point that serves as the first point of contact for queries about SPS regulations.

From 2009 to 2019, the number of SPS notifications related to animals/animal products and referencing Codex or OIE standards grew from 16 to 19 percent respectively. These notifications provide information about the SPS measures put in place by governments. Specific trade concerns (STCs) are questions raised by WTO members and brought forth to the SPS Committee for discussion and resolution. In 2009, 47% of STCs related to animals/animal products referenced Codex or OIE standards and in 2019 this number dropped to 38% of the total STCs.

Examples of STCs related to animals and animal products include highly pathogenic avian influenza (HPAI), bovine spongiform encephalopathy (also known as mad cow disease), foot and mouth disease, African swine fever and COVID-19 related trade restrictions.

International standards allow for a common understanding of requirements, enable access to international markets and facilitate smooth trade. It is important that stakeholders participate in the work of international standard-setting bodies such as Codex and OIE to ensure that the standards address the needs of different countries, and are up-to-date and relevant.

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Building Trust and Reconnecting Consumers with Farming



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Trust is the most valuable and tangible asset of any organization and to be able to earn and maintain consumer trust is essential to business success for any company.

Trust is the most valuable and tangible asset of any organization and to be able to earn and maintain consumer trust is essential to business success for any company. Priorities in the agriculture industry over the last 40 years have generally focused on science-based methods for increasing productivity, efficiency and throughput. However, there has been a fundamental shift in consumer and stakeholder priorities that elevates issues such as sustainability, ethical treatment of animals, food safety and nutrition. These issues are being addressed by organizations using Environmental, Social and Governance (ESG) goals and stakeholders across the industry now expect companies to prioritize ESG goals. In many instances, stakeholders call on organizations to elevate ESG goals over productivity and other traditional business goals.

Evolving Consumer Drivers

Today's consumer votes with their money. Consumer behaviors regarding the companies they are going to support and the products they are going to buy are based on their values. There are a number of these values driving purchase decisions that impact animal



Building and maintaining public trust creates social license among consumers and contributes to a company's freedom to operate.

agriculture. Attributes like sustainability and social responsibility impact purchase decisions in a way they never have before and this is particularly true for younger consumers who are more purpose- or values-driven. The relationship between diet, nutrition and health is a key consumer concern and has led to increased consumer interest in plant-forward and plant-based diets. In addition to perceived health benefits of a plant-based diet, consumers also aspire to make food choices that they deem better for the planet. Corporate transparency is a basic expectation among consumers today and companies who are not transparent are discounted. Consumers expect companies to recognize the environmental impact of their business operations and responsibly manage that impact. The ethical treatment of animals and animal well-being is another important factor driving purchase decisions.

Historically, the animal agriculture industry has connected with consumers based on facts and figures as well as rational arguments rooted in sound science. While a strong scientific underpinning remains crucial and is a key aspect of transparent authenticity, consumers expect to connect with organizations on social and emotional aspects as well. These social and emotional connections are complex and multi-dimensional but, without them, rational arguments will fall short with today's consumer and facts alone will not translate into purchase decisions.

Building and maintaining public trust creates social license among consumers and contributes to a company's freedom to operate. Freedom to operate involves

minimal outside interference and formalized restrictions. When trust is violated, consumers apply more social control and restrict social license in the form of legislation, regulation, litigation, or market mandates such as supply chain expectations. Issues related to animal welfare are a prime example of reduced social license when retailers and/or consumers demand certain expectations from the supply chain such as accepting only specific animal housing or animal health practices.

A New Trust Model

In order to examine factors that drive consumer trust, the Center for Food Integrity (CFI) partnered with researchers at Iowa State University. CFI is an international nonprofit organization whose mission is to help today's food system earn consumer trust and its members represent the diversity of the food system including farmers, ranchers, processors, food companies, retailers and restaurants. The research identified three primary trust drivers: the role of influential others, competency and confidence. Influential others are opinion leaders and friends who influence consumers on a particular topic. This could be a credentialed individual like a veterinarian or nutritionist or it could even be a neighbor or social media influencer. These influential others build trust and create a bridge between consumers and an organization. The second element in building trust is competency and this comes from fact-based technical information. As previously discussed, this is an area where animal agriculture typically excels given the science-based approach to the industry. The third element in building trust is confidence or the perception of shared values and ethics.

With these three drivers of trust in mind, CFI and Iowa State researchers then surveyed 6,000 US consumers over the course of three years, asking questions about issues related to animal agriculture such as food safety, on farm animal care and environmental concerns. Upon

analysis, the survey responses revealed that confidence is three to five times more important than providing facts when building trust.¹ In other words, consumers do not grant organizations permission to share facts and data with them if the organization has not crossed their shared values threshold and they won't believe that the organization cares about what is important to them. While strong scientific grounding is essential, if animal agriculture leads only with facts and science, building consumer trust will prove difficult.

Confidence is three to five times more important than providing facts when building trust.

A case study of this concept in action is the evolution of animal rights and animal protection. The organization People for the Ethical Treatment of Animals (PETA) has a long-standing reputation for using extreme edgy tactics to demand the elimination of meat, milk and eggs from the diet and to draw attention to the "immorality" of eating animal products. Their extreme stance was historically more than all but the most dedicated-to-the-cause consumers were willing to consider. In the 1990s, the Humane Society of the United States (HSUS) began to shift the focus from animal rights to animal protection drawing on the power of shared values with consumers. By demonstrating shared values regarding care for animals and prioritization of the planet, they appealed to consumer confidence and built their social license with a much broader target audience.

Typical response from animal agriculture to animal welfare campaigns designed to create consumer doubt has focused on facts and data rather than shared values. By its very nature, animal agriculture values and prioritizes the treatment and health of animals and can build social license by leading with confidence rather than competency. Animal agriculture organizations

cannot answer ethical questions with purely fact-based responses. Consumers asking ethical questions regarding animal housing, for example, will not be satisfied with a facts-only response. In order to engage in this conversation in a way that will build social license and support freedom to operate, the industry needs to first connect with the consumer on shared values and ethics.

Reconnecting With Consumers

A two-pronged approach to successful communication includes emotional and social reinforcement that animal protein is part of living a vibrant life as well as data that supports animal protein as part of a healthy and socially responsible diet. Animal protein is a central component of many of life's biggest and smallest pleasures. Whether it is the centerpiece of a

Animal protein is a central component of many of life's biggest and smallest pleasures.

family holiday gathering, a meal shared with friends at a sporting event, or a multi-generational treat on a hot summer day, animal protein has a legacy of helping people live their best lives and consumers want to celebrate those experiences. Second, the industry needs to tell the story of the farmers and relatable influential others, who care for animals day in and day out. The



men and women who are involved in production agriculture on a daily basis are extremely relatable because their passion for well cared-for animals, food safety, nutrition, health and protection of the environment will translate shared values.

Earning social license and protecting freedom to operate isn't accomplished through one campaign or communications channel. The industry needs to commit to long-term engagement in the conversation and to using a new, values-focused approach that can be sustained over time. It is also important to remember that

consumers are conditioned to be skeptical and they will raise questions, but this skepticism should be viewed as an opportunity to engage and communicate. 65 percent of the public in the US wants to know more about their food and the opportunity for the animal agriculture industry to be more engaged in the conversation is great.ⁱⁱ The voice of animal agriculture is invaluable and individuals in the industry can be a trusted resource both because of their vast amount of technical knowledge as well as the interpersonal connections they can make with consumers based on shared values about important issues.

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Conclusion

Developing a resilient and sustainable food system is not about completely revolutionizing the system, it's about evolving established institutions to reduce environmental impact while simultaneously enhancing farm livelihoods and food quality. It is important to focus on the totality of the food system, rather than individual segments to avoid unintended negative impacts. Science-based decision making is the backbone to evolving the food system and it is imperative that peer-reviewed, evidence-based science inform and guide conversations regarding sustainable food systems.

The livestock industry and animal protein play a critical role in sustainable food systems:

- Nutrient-dense animal-sourced foods have a critical role in the diet and continue to provide essential nutrition to people around the world.
- Calcium is an under-consumed nutrient across the globe and dairy foods are the number one source of calcium in the food supply.
- Plant-based proteins do not compare with animal-sourced protein as it relates to amino acid profiles because many plant-based proteins do not provide all the essential amino acids like meat does. It is also common misconception is that relying solely on plant protein to meet nutrition needs is both affordable and sustainable.
- Scientifically-sound animal care programs can prevent or control disease and will lead to more sustainable herd productivity.
- In the United States, and in most developed countries, more than 80% of all GHGs originate from fossil fuels while only approximately 4% originates from livestock.
- Innovations in genetics and new breeding approaches have the potential to play an important role in minimizing animal sickness to improve the sustainability of agriculture and eliminate disease.

Being part of the conversation and engaging proactively at the country-level in food systems dialogues is essential. It is imperative that the industry participates in thought leadership opportunities and continues to engage with diverse audiences to build and foster relationships and engage in idea-sharing.



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