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# Meat, Poultry, and Dairy

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**Research Briefing**

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### Social Capital

- Food Safety

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### Business Model & Innovation

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- Supply Chain Management

## Industry Summary

The Meat, Poultry, and Dairy industry produces raw and processed animal products, including meats, seafood, eggs, and dairy products, for human and animal consumption. Key activities include animal raising, slaughtering, processing, and packaging. As fishing and aquaculture is a relatively small proportion of the industry's sales, this industry brief will focus on the production of the top animal proteins. The industry sells products primarily to the processed foods industry and to retail distributors.<sup>1</sup> Global industry sales were approximately \$610 billion in 2013.<sup>2</sup> The U.S. is the largest producer of poultry and beef, and the third largest producer of pork and pork products.<sup>3</sup> The industry is competitive but maturing, with ongoing consolidation.<sup>4</sup> For example, in June 2013, Chinese firm Shuanghui purchased Smithfield Foods, the world's largest pork producer.<sup>5</sup> In June 2014, Tyson Foods acquired Hillshire Brands for \$8.55 billion, exceeding the final bid by competitor Pinnacle Foods.<sup>6</sup>

Demand for most animal products is relatively non-cyclical, as many products are staple foods. In 2009, during the height of the 2007-2009 recession, revenues fell approximately seven percent among meat, beef, and poultry processing companies. In economic downturns, consumers tend to shift to lower quality products instead of reducing consumption. Key end markets include frozen foods, restaurants, livestock and pet feed, grocery retailers, and exports.<sup>7</sup> Long-term global consumer trends indicate increasing expenditures on higher value foods such as meat and dairy products across income levels.<sup>8</sup>

Key cost drivers are the prices of inputs including animals, animal feed, labor, electricity, and fuel and oils.<sup>9</sup> Animals and animal feed are the primary costs. Between 2006 and 2011, animal feed comprised 50, 15, and 45 percent of the cost of producing milk, cows, and hogs, respectively.<sup>10</sup> Much of the feed is crop-based; cattle consume almost half of all corn grown in the U.S. Feed costs are often passed on to the end consumer.<sup>11</sup> Profitability in the industry is strongly correlated with farm size.<sup>12</sup> Net profit margins of the top five companies previously cited averaged 4.3 percent in fiscal year 2013.<sup>13</sup>

The industry's greatest barrier to entry is regulation, the majority of which calls under the U.S. Department of Agriculture (USDA) and the U.S. Environmental Protection Agency (EPA). The agencies ensure standards for food safety and environmental externalities.<sup>14</sup> Barriers to entry for small farms are lower than for industrial-scale farms, which require substantial capital expenditures for animals, machinery, and land. This has contributed to a shift towards concentrated industrial animal production operations across the industry.<sup>15</sup> The rise of industrialized farming techniques and technology, including concentrated animal feeding operations (CAFOs), have greatly enhanced industry productivity.<sup>16</sup> The proportion of production from small, family-owned farms is relatively low today, as economics propels the shift to CAFOs. The United Nations Food and Agriculture Organization (FAO) estimates that CAFOs account for 72 percent of poultry production, 43 percent of egg production, and 55 percent

<sup>1</sup> Industry composition is based on the mapping of the Sustainable Industry Classification System (SICS™) to the

Bloomberg Industry Classification System (BICS). A list of representative companies appears in Appendix I.



of pork production globally.<sup>17</sup> Most meat and dairy products are produced in single-species farms. Key innovations include advances in breeding techniques, animal pharmaceuticals, specialized feed, and mechanization.<sup>18</sup> This shift toward larger, more efficient operations is expected to continue, and underlies some of the industry's sustainability issues.<sup>19</sup>

The industry's largest companies, including Tyson Foods Inc., BRF SA, and Hormel Foods Corp., have international operations. The U.S. is the largest overall meat producer, and the leader in poultry and beef. U.S. exports have risen as a result of domestic surplus. The major export markets from the U.S. are Mexico, Japan, Canada, and China. In the U.S., production is focused in California, the Midwest, and the South.<sup>20</sup>

A core driver of growth has been the rising demand for meat proteins in emerging markets. As a result, major industry players have invested in expanding operations overseas. Exports are expected to represent an increasing share of U.S. domestic revenues.<sup>21</sup> Furthermore, consumer trends towards eating healthier foods will expand the higher-margin sales of organic and lean-cut products.<sup>22</sup>

As the global middle class expands, demand for food and food products will grow, driving increasing production.<sup>23</sup> A dynamic regulatory environment, consumer preferences, and climate change underlie key sustainability trends within the industry. The sustainability issues outlined in this brief are key factors in the long-term evolution of the industry.

### Legislative & Regulatory Trends in the Meat, Poultry, and Dairy Industry

Due to the global nature of meat, poultry and dairy goods production and trade, multiple regulatory frameworks impact the industry. In the U.S., the industry is regulated at the federal, state, and local levels. Generally, legislation and regulations control the release

of substances to air, water, and land during farming and processing, the safety of consumer foods, and worker health and safety. The following section provides a brief summary of key regulations and legislative efforts related to this industry.<sup>ii</sup>

The USDA oversees numerous aspects of U.S. agriculture, including animal health, quality assurance, livestock insurance, biotechnology, product inspection, distribution, and export regulations, while the Food, Agriculture, Conservation, and Trade Act (commonly termed the Farm Bill) is the primary agricultural policy tool of the U.S. Government.<sup>24, 25</sup> The Act must be renewed every five years.<sup>26</sup> Agricultural policy also addresses key environmental and social issues. The 1990 Farm Bill defined sustainable agriculture as a system that will satisfy food and fiber needs, enhance environmental quality and the agricultural natural resource base, make the most efficient use of non-renewable resources, sustain the economic viability of farm operations, and enhance the quality of life for farmers and society.<sup>27</sup>

As part of the food industry value chain, meat, poultry, and dairy producers are subject to extensive product safety regulatory oversight. Naturally, consumers are also concerned with product safety and quality. In the U.S., the Federal Food, Drug, and Cosmetic Act regulates pesticide use in or on foods and animal feed. Pesticide use is closely linked to food safety, and consumers are increasingly aware of potential health risks.<sup>28</sup> The USDA's Animal and Plant Health Inspection Service (APHIS) monitors imported livestock as a precaution against the importation of animal diseases such as foot-and-mouth disease. APHIS has the authority to destroy animals that present a threat to human health or the U.S. livestock inventory. To help prevent food-borne illnesses such as salmonella, the USDA's Food Safety and Inspection Service (FSIS) inspects animals, meats, and slaughter facilities.<sup>29</sup>

Environmental regulations are implemented largely at the state and local level based on federal guidance, with the exception of being CAFOs, which have federal waste permits.<sup>30</sup> The Comprehensive Environmental Response,

<sup>ii</sup> This section does not purport to contain a comprehensive review of all regulations related to this industry, but is

intended to highlight some ways in which regulatory trends are impacting the industry.



Compensation, and Liability Act (CERCLA, or Superfund) and Emergency Planning and Community Right-to-Know Act (EPCRA) regulate management of animal waste and relevant emissions. Animal production facilities, especially CAFOs, can generate considerable quantities of chemical pollutants, including ammonia and hydrogen sulfide. Currently, only CAFOs housing more than EPA-specified numbers of animals, depending on species, are required to report releases under CERCLA and EPCRA. Animal production can also have sizable impacts on water resources, largely through animal waste releases, sediment, pathogens, and the use of pesticides.<sup>31</sup> The Clean Air Act (CAA) and Clean Water Act (CWA) regulate air and water emissions from operations, respectively. Animal production generates significant GHG emissions, especially methane (CH<sub>4</sub>), as well as emissions regulated under the National Ambient Air Quality Standards (NAAQS), including particulate matter, or dust.<sup>32</sup> Furthermore, the EPA's Mandatory Greenhouse Gases Reporting Program (GHGRP), finalized on September 22, 2009, requires major suppliers and emitters of greenhouse gases (GHGs) (greater than 25,000 tons annually) to monitor and report emissions. This rule may pertain to manure management facilities.<sup>33</sup>

The industry is required to adhere to specific employee health and safety standards. In the U.S., these standards are enforced by the Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor.

## Sustainability-related Risks & Opportunities

Industry drivers and recent regulations suggest that traditional value drivers will continue to impact financial performance. However, intangible assets such as social, human, and environmental capitals, company leadership and governance, and the company's ability to innovate to address these issues are likely to contribute progressively more to financial and business value.

Broad industry trends and characteristics are driving the importance of sustainability performance in the Meat, Poultry, and Dairy industry:

- **Consumption of natural resources:** Meat & poultry companies utilize natural capital inputs including land, crop-based animal feed, and water. Rising food demand worldwide drives the industry's resource requirements ever higher. Regulation and climate change could lead to higher costs or unstable supplies of natural resources.
- **Environmental externalities:** Animal farming and animal products processing generate negative environmental externalities, including GHG emissions, and air, land, and water pollution, that can harm human health and ecological systems. These externalities generate regulatory and operating risks.
- **Social externalities:** The industry is dependent on consumers' confidence in product quality and safety. Contaminated or otherwise compromised meat, poultry, and dairy products can be harmful to human health. This may lead to lost sales, product recalls, and damaged brand reputation.
- **Consumer Trends:** Consumer trends indicate increasing concern with the industry's use of antibiotics, hormones, concentrated feeding operations, and genetically modified feed.

As described above, the regulatory and legislative environment surrounding the Meat, Poultry, and Dairy industry emphasizes the importance of sustainability management and performance. Recent trends suggest a regulatory emphasis on environmental and consumer protection, which will serve to align the interests of society with those of corporations.

Specifically, the sustainability issues that will drive competitiveness within the Meat, Poultry, and Dairy industry include:

- Managing GHG emissions from animals and animal waste;

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- Improving water efficiency to reduce water-related risks, especially in locations of water scarcity;
- Preserving ecological resources and biodiversity by limiting the contamination and degradation of land and water resources;
- Ensuring the safety and quality of products to protect human and animal health;
- Ensuring worker health and safety and maintaining a strong safety culture; and
- Ensuring that animal raising and production is conducted humanely, and in consideration of consumers' trending avoidance of animal products that have been treated with antibiotics and hormones;
- Adapting to the effects of climate change; and
- Managing social and environmental risks in the supply chain.

The following section provides a brief description of each sustainability issue that is likely to have material implications for companies in the Meat, Poultry, and Dairy industry. This includes an explanation of how the issue could impact valuation, and evidence of actual financial impact. Further information on the nature of the value impact, based on SASB's research and analysis, is provided in Appendix IIA and IIB. Appendix IIA also provides a summary of the evidence of investor interest in these issues. This is based on a systematic analysis of companies' 10-K and 20-F filings, shareholder resolutions, and other public documents.

## Environment

The environmental dimension of sustainability includes corporate impact on the environment, either through the use of non-renewable natural resources as factors of production (e.g., water, energy, minerals), or through environmental externalities or other harmful releases in the environment, such as air and water pollution, waste disposal, and greenhouse gas (GHG) emissions.

Animal rearing and processing utilizes natural capital inputs including water, land, and crop-based animal feed, and contribute to environmental pollution and habitat degradation, primarily through GHG emissions, chemical use, grazing practices, soil erosion, and land, water, and air contamination. The industry directly influences anthropogenic climate change by generating GHGs, mostly through enteric fermentation (as part of the normal digestive process of animals), and animal waste management. These emissions present a risk, as GHG regulations are likely to become increasingly stringent worldwide, although current regulatory limits on emissions are voluntary in this industry in the U.S. In the EU and California, there are binding GHG emissions regulations, which could affect the industry in the future. Furthermore, water is an essential component in animal raising and processing purposes. This poses an operating risk as global water demand and water stress continue to rise. In addition, animal farming and processing are land-intensive and generate considerable waste, which may result in ecological damage, including water, soil, and air contamination, habitat destruction, and biodiversity loss. These factors, which are of special concern in ecologically sensitive regions, may be detrimental to the productivity of animals and the industry's ability to operate due to regulatory concerns.<sup>34</sup>

As the animal products value chain is highly dependent on environmental inputs, the sustainable management of natural resources is a key business challenge.

## Greenhouse Gas Emissions

The Meat, Poultry, and Dairy industry generates significant GHG emissions, contributing to climate change and creating regulatory risks due to climate change mitigation policies. Unlike other GHG-intensive industries, which typically burn fossil fuels or consume electricity, the majority of emissions in this industry stem directly or indirectly from the animals themselves. These emissions are relatively difficult to measure or estimate. While companies in this industry do use fossil fuel and electrical energy for processing, transportation, and other requirements, the emissions generated from



these activities are, in general, relatively low when compared to animal-derived emissions.<sup>35, 36</sup>

The industry's greenhouse gases are difficult to estimate, especially when including indirect emissions.<sup>37</sup> The direct emissions from livestock production, including enteric fermentation, manure management, and processing and transportation of animal products, represent approximately 8 percent of global GHG emissions, and about 3.3 percent of U.S. GHG emissions.<sup>38,39</sup> These figures do not include indirect emissions from animal feed production, which fall within the scope of the Agricultural Products industry. Given the industry's considerable contribution to climate-change inducing GHGs, future emissions regulation could result in additional operating or compliance costs.

Company emissions performance can be analyzed in a cost-beneficial way internally and externally through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Gross global Scope 1 emissions, percentage from non-technical sources; and
- Description of long-term and short-term strategy or plan to manage Scope 1 emissions

**Evidence:** Although the industry's GHG footprint receives relatively little attention, the industry faces uncertainties about the nature and extent of future GHG regulations. Methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) are the primary GHGs generated from the Meat, Poultry, & Dairy industry,<sup>40</sup> and are 25 times and 310 times more potent greenhouse gases than carbon dioxide, respectively.<sup>41</sup> In 2012, emissions from animal production, including enteric fermentation and animal waste, represented approximately 34.6 percent of U.S. agricultural GHG emissions.<sup>42</sup> In the U.S. between 1990 and 2006, CH<sub>4</sub> emissions from hog and dairy cow manure rose 35 percent and 49 percent, respectively, a result of increased use of CAFOs and manure lagoons.<sup>43</sup>

Emission reporting requirements are one facet of regulatory risk. Some CAFO manure management and animal processing facilities with N<sub>2</sub>O or CH<sub>4</sub> emissions above EPA

emissions thresholds may be required to report under the GHRP. In 2009, the EPA estimated that 107 CAFO facilities would have to report under the GHGRP. However, Congressional legislation has not yet allocated funding for GHGRP reporting of agricultural sources, so no facilities are currently required to report.<sup>44</sup> Emissions from animals themselves are not covered under the GHGRP.<sup>45</sup> The EPA's 2010 Corporate Average Fuel Economy Standards (CAFE) triggered two requirements under the CAA that may apply to agricultural sources. The first is a rule under Title V of the CAA that requires stationary sources generating emissions over a set threshold of regulated substances to obtain permits. Fugitive emissions are exempt. The second requires new or modified facilities to install Best Available Control Technologies (BACT) to reduce emissions. The EPA has not identified any agricultural facilities that must adhere to these requirements under current emissions thresholds. However, future revisions to the standards could apply to certain facilities within the Meat, Poultry, and Dairy industry.<sup>46</sup>

The industry could also fall under state or local emissions protocols due to its high emissions values. Although California's historic AB-32 GHG regulatory framework currently excludes agricultural sources of emissions, California's Air Resources Board estimates that by 2020, agriculture, including livestock production, could contribute as much as 10 percent, or 17 million metric of CO<sub>2</sub>e, towards California's GHG reduction target.<sup>47</sup> As emissions reduction initiatives become more stringent over time, regulators may include large emitters that are currently omitted, such as some agricultural sources, in order to attain reduction objectives.

There are opportunities for the industry to offset GHG emissions and simultaneously earn revenue from carbon offset credits. Facilities producing animal waste can sequester GHG emissions by installing anaerobic digester or covered manure pit technology. Successful anaerobic manure digesters are installed at many farms in the U.S., generating Renewable Energy Credits (RECSs), which are then sold to local utilities.<sup>48,49</sup> The EPA estimates that there are 239 operational anaerobic digester systems at commercial livestock farms in the U.S.<sup>50</sup>



Corporate financial disclosures address potential financial impacts of GHG regulation. Hillshire Brands, a major meat and poultry producer, reported in its 2013 FY10-K that “Increased government regulations to limit carbon dioxide and other greenhouse gas emissions as a result of concern over climate change may result in increased compliance costs, capital expenditures and other financial obligations for [the company].”<sup>51</sup>

**Value Impact:** GHG emissions primarily present a regulatory risk. As the majority of emissions in this industry are difficult to control, future emissions regulation may require companies to purchase emissions offset credits, resulting in lower profits. Regulations may also require best available technologies to lower emissions, demanding capital expenditures. Conversely, the potential to capture emissions from point sources such as CAFOs presents a revenue opportunity, as captured methane emissions may have market value, or the carbon offset credits generated during emissions reductions could be sold. These developments could positively impact company profitability.

While regulatory development in this area is an inherently slow process whose outcome is nearly impossible to predict, the probability and magnitude of the impact of GHG emissions on the industry are likely to increase in the near- to medium-term, given the trend towards greater regulation of GHGs.

## Water Management

Water is an essential factor of production in the Meat, Poultry, and Dairy industry, as it is required to hydrate animals and for the processing of animal products. The availability of adequate water supplies presents a growing operating challenge.

While water has historically been an abundant commodity in many parts of the world, it increasingly becoming an increasingly scarce resource due to population growth, increasing consumption per capita, poor water management, and climate change. By 2025, estimates say, important river basins in the U.S., Mexico, Western Europe, China, India, and Africa will face severe water problems as demand overtakes renewable supplies. Many important river basins can

already be considered “stressed.” Increasing demand for water will likely increase competition between agricultural and other key water users. Water scarcity can result in higher supply costs and risks of shortages for companies reliant on stable water supplies, including meat, poultry, and dairy producers.<sup>52</sup> In this industry, operations reliant on surface waters for animal hydration and pasture are particularly vulnerable to increases in water stress.

Company water efficiency and water-related risks can be analyzed in a cost-beneficial way internally and externally through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Total fresh water withdrawn, percentage recycled, percentage in regions with High or Extremely High Baseline Water Stress

**Evidence:** Water risk exists during animal farming and animal product processing. Rising water stress worldwide underscores the importance of water efficiency and securing adequate, stable supplies.

Although livestock represent less than one percent of global freshwater consumption, water may be more important in dry areas or regions of rising water stress. For example, livestock drinking water needs represent 23 percent of total freshwater consumption in Botswana, an arid country.<sup>53</sup> Water stress has already impacted some of the industry’s productive regions, including California, which represents 7.1 percent livestock and livestock product revenue in the U.S..<sup>54</sup> Persistent drought in the state has severely depleted surface water supplies. As a result, ranchers in the state have begun to reduce their herds, both through slaughter and by sending animals east to U.S. regions with greater water availability. As of April 2014, Reuters estimated that as many as 100,000 head of cattle had been transported east due to the drought, or approximately 2 percent of the State’s beef and dairy cows.<sup>55, 56</sup> Researchers at University of California at Davis estimate that the drought will reduce livestock and dairy revenues by \$203 million in 2014 alone, a result of reduced pasture availability and higher hay and silage costs.<sup>57</sup> Research by the California Air Resources Board finds that by 2050, the average Sierra

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Nevada snowpack, which supplies much of the state's water, may decline by as much as 40 percent. This could affect both the availability of surface water for animal consumption as well as reduce the health of natural pasture grasses.<sup>58</sup>

Meat products are generally more water-intensive than plant-based foods. Producing one kilocalorie from meat requires as much as ten times more water than one kilocalorie from grains, fruits, or vegetables.<sup>59</sup> This includes water used to produce crop-based animal feed, which represents more than half of water used in the industry worldwide.<sup>60</sup> In industrialized animal production, animals are given water in troughs, as animals do not have access to water-rich grasses or natural water sources, and water represents only between 5 and 12 percent of feed weight by percentage.<sup>61</sup> However, by one estimate, the production of one pound of beef requires 18.6 gallons of water for drinking and processing alone.<sup>62</sup> On an individual company basis, water intensity varies with factors including type of animal raised and the scale of farming operations. In addition to drinking water for animals, water is required to service the facilities through cleaning production units, washing animals, cooling facilities, animals, and products, and waste disposal.<sup>63</sup> Tyson Foods, a major poultry and meat products supplier, reported using 25.3 billion gallons of water in its global operations in FY2013. The company used much of this water for washing its products, a procedure necessary required by government regulation to ensure product safety. Therefore, there is not always a substitute for water in certain industry processes, emphasizing the importance of water efficiency. Tyson reports reducing water use per pound of product by 14.7 percent between 2004 and 2013. In addition, the company's voluntary programs show a concern over water consumption. As part of Environmental, Health, and Safety Management System Standards, Tyson requires facilities using more than one million gallons of water per week to implement a Water Conservation Plan that establishes a water reduction goal and corresponding timeframe. Additionally, the company is currently undertaking a water scarcity and usage assessment of its production facilities in collaboration with the University of Arkansas.<sup>64</sup>

**Value Impact:** Water use can have diverse financial implications. Increasing water scarcity worldwide may reduce the availability of surface waters for animal consumption, requiring the reduction or translocation of herds, or the importation of water. A stable water supply is also necessary for animal product processing. Water prices may rise due to increasing demand and lower regional supply, impacting operating margins. Furthermore, limited access to water could directly affect the ability to operate processing facilities. Herd reduction could lower potential revenues and cash flow, and in turn negatively affect a company's credit profile.

Water costs are gradually expected to rise across the globe. This is a result of human consumption increasing with higher standards of living, existing sources becoming unfit for use due to pollution, and climate change causing variations in precipitation patterns. Therefore, the probability and magnitude of the impact of water management on financial results in the industry are likely to increase in the near term.

### Land Use & Ecological Impacts

Meat, poultry, and dairy operations have diverse ecological impacts, including biodiversity loss, which is primarily a result of land use and contamination by waste. The primary channels of impact are water, air, and land contamination, and land degradation, including deforestation and erosion. Non-CAFO animal farming, where large tracts of pasture land are required, can lead to physical degradation of land resources. The primary concern from CAFOs and animal product processing facilities is the generation of waste, which can release pollutants into the environment. With food demand projected to grow by 50 percent by 2030, and increasing per-capita consumption of meat proteins worldwide, the Meat, Poultry, and Dairy industry will expand, further encroaching on land resources and causing increased ecological impacts.<sup>65</sup>

In this industry, land use and ecological impacts result in regulatory risks from fines, litigation, and difficulties obtaining permits for facility expansions or waste discharges. Companies could face regulatory or reputational barriers to expanding operations



in ecologically sensitive areas due to more stringent, including permitting to protect ecosystems and endangered species. In fact, the number and size of protected conservation areas has increased exponentially around the world over the past several years.<sup>66</sup>

Biodiversity and agriculture have a bidirectional relationship; agriculture is one of the greatest drivers of biodiversity loss in terrestrial regions, and biodiversity changes can indirectly impact agricultural systems' susceptibility to pathogens and pests.<sup>67,68</sup> Water, air, and soil contamination presents a regulatory risk, while treating the waste from facilities may require additional water or waste treatment, raising costs.<sup>69</sup> Water contamination may also indirectly affect the industry by increasing treatment costs for purchased or naturally sourced water.

Company performance in this area can be analyzed in a cost-beneficial way internally and externally through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Amount of litter and animal waste generated; and
- Percentage of operations managed to Comprehensive Nutrient Management Plan; and
- Percentage of operations that are CAFO; and
- Number of incidents of non-compliance with water-quality permits, standards, and regulations

**Evidence:** The industry's ecological impacts, which may occur at all stages of production, vary depending on the nature and scope of operations. Livestock currently account for approximately 20 percent of terrestrial biomass. The sheer number of animals creates environmental externalities, some of which are discussed below, while the industry's considerable land requirement exacerbates environmental impacts.

Animal waste and physical land impacts are the primary drivers of ecological damage and biodiversity loss. Non-concentrated animal production requires vast tracts of land for animal pasture and contributes to physical land degradation as well as environmental pollution. Grazing lands comprise 26 percent

of Earth's terrestrial surface; grazing contributes to deforestation. For example, nearly 70 percent of the Amazon region's forest has been converted to animal pasture, while crops for animal feed occupy much of the remainder. Globally, biodiversity is threatened by an expected increase in pastureland.<sup>70</sup> Twenty-three of Conservation International's 35 'global hotspots for biodiversity' and 306 of the Worldwide Fund for Nature's 825 terrestrial eco-regions under threat are directly affected by livestock production.<sup>71</sup> Deforestation contributes to biodiversity loss through habitat fragmentation, greater opportunities for the propagation of invasive plant species, and increased prevalence of destructive fires. Furthermore, nearly 70 percent of pastureland in arid regions worldwide is considered degraded due to livestock-induced erosion, compaction, and overgrazing. Overgrazing and overstocking can contribute to loss of habitat for both plants and animals via erosion, desertification, encouraging alien plant species invasion, destroying vegetation, and increasing watershed sedimentation.<sup>72</sup> In addition, livestock pasturing can contribute to the spread of contagious diseases between livestock and wild animals.<sup>73</sup> Many of these impacts also present themselves in the supply chain of meat, poultry, and dairy producers.

Ecological impacts also arise from the chemicals, nutrients, pathogens, biological matter and heavy metals found in animal manure and process waste. These substances enter the environment through air emissions, runoff, and waste discharges from pastureland, animal housing facilities, manure storage facilities, and processing plants.<sup>74</sup> In the U.S., an estimated 238,000 farms and ranches generate an estimated 500 million tons of manure annually. These are considered nonpoint pollution sources.<sup>75</sup> In 2008, there were approximately 15,300 CAFOs in the U.S. large enough to require CERCLA or National Pollutant Discharge Elimination permits.<sup>76,77</sup>

Animal waste runoff from croplands (where it is applied as fertilizer) and CAFOs can lead to nutrient loading (eutrophication) in rivers, lakes, and oceans, causing algal blooms that can release toxins and cause severe hypoxic water conditions, which can injure or kill aquatic life. The primary nutrients contained in animal wastes are nitrates and phosphorus.



A well-known example of eutrophication is the large 'dead zone' in the Gulf of Mexico, created in part by agricultural runoff from the American Midwest that enters the Gulf via the Mississippi River.<sup>78</sup> Meat, poultry, and dairy producers have come under public and regulatory scrutiny for their contribution to nutrient pollution. In 2007, Pilgrim's entered into a Memorandum of Understanding with the Commonwealth of Virginia to use a feed supplement to lower phosphorus content in poultry litter by up to 30 percent.<sup>79</sup> Animal waste may also contain antibiotics and animal hormones, which are used to improve animal health and increase weight. However, these substances can leach into local soil and water. Hormones have been found in surface waters near CAFOs, and are linked to changes in the reproductive habits of aquatic species, including a substantial decrease in female fish fertility.<sup>80</sup>

Within the industry, large accidental releases of waste have occurred periodically, resulting in ecological damage and regulatory fines. For example, a 2011 spill of 200,000 gallons of waste from a hog facility waste lagoon in Illinois contaminated a nearby river, killing more than 110,000 fish over a stretch of 19 miles of the river. The Illinois EPA later fined the facility operator, a privately held company, more \$81,000 in fines and recouped remediation expenses.<sup>81</sup> In a 2014 report, the Illinois EPA found that the state's many livestock facilities contribute to pollution across the state. More than 672 miles of the state's streams and more than 25,000 lakes have been contaminated by animal feeding operations. This makes the facilities among the top ten contributors to environmental pollution of rivers and lakes in the state. The Illinois EPA also found that approximately 60 percent of livestock facilities in the state reported at least one spill or regulatory infringement in 2011.<sup>82</sup> Recurring releases could result in financial impacts due to the accumulation of fines.

Waste that contaminates surface or groundwater is of particular concern, as it can influence aquatic ecosystems and local water supplies and move great distances. Meat, poultry, and dairy production facilities generate regulated wastewater that must be treated before discharge or recycling. For example, Tyson Foods reports operating 34 full-treatment and 43 pretreatment

wastewater facilities. Between 2010 and 2012, the company reduced its wastewater permit exceedances and notices of violations of water quality standards by 48 and 86 percent, respectively.<sup>83</sup> Waste discharges can result in regulatory action. In 1997, the EPA fined Smithfield Foods, Inc., and two of its subsidiaries \$12.6 million for violations of the Clean Water Act, at the time, the largest CWA fine in history. The company allegedly discharged wastewater from its hog slaughtering and processing operations into the Pagan River in Virginia, resulting in more than 5,000 water discharge permit violations over the course of five years. The water contained high levels of substances including phosphorous, ammonia, cyanide, oil, grease, and fecal coliform, a result of the company's failure to install adequate treatment equipment.<sup>84</sup>

Companies discuss potential financial liabilities from wastewater disposal in financial disclosures. For example, National Beef reported wastewater treatment cost risks in its FY2013 10-K. The company utilizes both municipal wastewater treatment facilities as well as its own treatment plants. The company stated that, as water quality discharge requirements become increasingly strict, it "could be asked to contribute toward the costs of such upgrades or to pay increased water or sewer charges... National Beef may also be required to undertake upgrades and make capital improvements to its own wastewater pretreatment facilities, the cost of which could be significant."<sup>85</sup>

Animal waste generated by CAFOs presents the industry's greatest public health risk due to possible contamination of air and water resources. Manure quantities vary with the number and type of animals on a farm, and may range between 2,800 tons and 1.6 million tons per year, by some estimates. As discussed, animal waste can contain nutrients that impact ecological systems. In addition, it may contain substances that harm water quality. According to the EPA's 2000 National Water Quality Inventory report, 29 U.S. states identified animal feeding operations as factors in water quality impairment.<sup>86</sup>

In 2002, in response to community health concerns regarding local swine production facilities, officials in Cerro Gordo County, Iowa, placed a one-year moratorium on the



construction or expansion of animal production, feeding, and housing facilities. The moratorium was repealed in 2005 after provisions for fines for violations of environmental and human health codes were established. Health officials believe that the moratorium prevented expansion in hog production operations in the county even after the moratorium was lifted.<sup>87</sup>

While not as great in magnitude as the solid wastes generated at CAFO facilities, regulated air emissions also contribute to environmental pollution and regulatory risk. The largest commercial egg producer in Ohio, Buckeye Egg Farm, LP, agreed to spend more than \$1.4 million to install air emission pollution controls to reduce Particulate Matter (dust) and ammonia emissions from its egg-laying facilities. The company also paid an \$880,598 civil penalty to settle allegations that it failed to obtain the necessary air permits and emissions samples.<sup>88</sup> PM emissions can cause bronchitis and other systemic effects, including decreased lung function and cardiac arrest. Studies in North Carolina and elsewhere found that children living near factory farms show increased asthma rates.<sup>89</sup>

**Value Impact:** The industry's ecological impacts are diverse. Degradation of land resources such as pastureland or water resources can harm local or regional ecosystems. This can ultimately lower animal productivity, affecting the volume of salable products. Contamination of water resources can also affect human health. Companies with a poor environmental management record can experience difficulty obtaining waste emission permits, or be required to pay fines for waste or air emissions exceedances. Recurring fines could harm investors' perception of management quality and in turn affect company valuation.

## Social Capital

Social capital relates to the perceived role of business in society, or the expectation of business contribution to society in return for its license to operate. It addresses the management of relationships with key outside stakeholders, such as customers, local

communities, the public, and the government.

The Meat, Poultry, and Dairy industry produces foods for human and animal consumption. Food safety and quality is an inherent sustainability issue for the industry. Strict regulations govern the production of animal products in most markets, and consumer demand is highly dependent on perceptions of food safety. Reporting on the management of issues related to food quality and safety will enable investors to assess whether companies are positioned to deal with evolving regulations and public and customer concerns about public health, and therefore protect shareholder value.

## Food Safety

Meat, Poultry, and Dairy products are sold directly to consumers as food in raw form (e.g. milk or eggs) or are further processed into a wide variety of foods. Maintaining product quality and safety is crucial, as contamination by pathogens, chemicals, or spoilage presents serious human and animal health risks. This includes the use of sub therapeutic antibiotic use in animal raising. Companies can be impacted through product recalls, damaged brand reputation, and increased regulatory scrutiny. These factors can lower revenues directly through lost sales, and indirectly via consumer aversion to at-risk products and other shifts in consumers' perceptions of food safety. Furthermore, regulation can lead to higher costs or lost revenues through trade restrictions.<sup>90</sup>

There are other issues that may affect food safety. The use of animal hormones to boost growth and the consumption of genetically modified foods are part of increasing consumer awareness of and concern over animal production. It is unclear what, if any, effects genetically modified foods and animal hormones have on humans and animals. These topics are discussed in the Animal care and Welfare issue. On the other hand, poor management of product quality and safety may raise the likelihood of financial impacts from product recalls, litigation, and reputational damage.



Company performance in this area can be analyzed in a cost-beneficial way internally and externally through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Number of recall issues, total weight of product recalled; and
- Number of facilities certified to an approved standard; and
- List of markets banning import of registrant's products

**Evidence:** In the U.S., the FDA maintains oversight over food production to ensure proper procedures are followed to prevent the distribution of unsafe food. Additionally, the FDA oversees product recalls and procedures to remove and correct safety issues when they occur. The FDA's role was recently modified by the Food Safety Modernization Act, signed into law by President Obama on January 4, 2011.<sup>91, 92</sup>

Food safety concerns present a direct regulatory risk. According to Hillshire Brands Corp., "...food safety practices and procedures in the meat processing industry recently have been subject to more intense scrutiny and oversight and future outbreaks of diseases among cattle, poultry or pigs could lead to further governmental regulation."<sup>93</sup>

Food safety issues may arise during the production or processing phase. Companies must follow strict regulatory guidelines to ensure safety. However, inadvertent contamination has and will continue to occur periodically. Certain factors in the production phase may increase the prevalence of contamination from pathogens. Studies suggest that the prevalence of antibiotics in animal production contributes to the rise of antibiotic-resistant strains of pathogenic bacteria in animal products. This presents a human health risk. Regulators have responded accordingly: In 2001, the American Medical Association approved a ban on the low-level application of antibiotics, while the FDA and World Health Organization are opposed to their use, and the European Union banned the use of antibiotics as farm animal growth promoters in 2006.<sup>94, 95</sup> In December 2013, the FDA announced a plan to phase out the use of antibiotics during the production of cows, chickens, and swine. The

action came in response to mounting concerns of antibiotic resistance in the human population.<sup>96</sup> This concern can affect demand from key customers of the Meat, Poultry, and Dairy industry. Buyers including McDonald's have eliminated meats treated with antibiotics from their value chain.<sup>97</sup>

The presence of disease in food products can lead to revenue impacts from bans on imports of meat products, and lost revenues due to consumer avoidance of certain products. One well-known example is that of bovine spongiform encephalopathy (BSE), or "Mad Cow Disease." Following the discovery of BSE in cattle in Washington State in December 2003, 53 countries banned imports of all U.S. beef. A study by researchers at the Kansas State Department of Agriculture and Kansas State University found that the bans led to U.S. beef industry revenue losses of between \$3.2 and \$4.7 billion in 2004. The U.S. beef industry's exports plunged by 82 percent starting in 2003.<sup>98</sup> Company disclosure also alludes to the effects of disease outbreaks: Hillshire Brands Corp. states in its FY 2013 10-K that, "The outbreak of disease could adversely affect our supply of raw materials, increase the cost of production and reduce operating margins. Additionally, the outbreak of disease may hinder our ability to market and sell products."<sup>99</sup>

A shift in consumer demand due to food safety concerns can damage an entire industry. For example, after an August 2010 recall of more than 500 million eggs by a U.S. producer due to a Salmonella outbreak, negative media attention caused consumer demand to fall. The ensuing drop in demand cost the industry at least \$100 million in lost sales in September 2010 alone.<sup>100</sup>

In addition, companies can face direct costs from product recalls. In 2008, the Westland/Hallmark Beef Corporation of California voluntarily recalled 143 million pounds of beef, the largest beef recall in U.S. history. The cause was fears over BSE, as some of the company's cows had been filmed being unable to walk, a symptom of the disease; however the USDA deemed that the health risks were slight.<sup>101</sup> Initial costs of the recall exceeded \$116 million, and the company later filed for bankruptcy.<sup>102</sup>



In February 2014, at the request of the FSIS, Rancho Feeding Corporation of California recalled 8.7 million pounds of beef from 'diseased and unsound' animals that had not been properly inspected by the USDA. This was a Class I USDA recall, which "is a health hazard situation where there is a reasonable probability that the use of the product will cause serious, adverse health consequences or death." The USDA's Office of the Inspector General has launched a criminal investigation into the company, which has voluntarily shut down operations.<sup>103 104</sup>

Dean Foods discusses the material risks from food contamination, product recalls, and consumer preferences in its FY2013 10-K, stating that "the negative publicity surrounding such assertions regarding our products or processes could materially and adversely affect our reputation and brand image..." Furthermore, in regards to demand for specific products, "consumer preferences related to genetically modified foods or the use of certain sweeteners could result in negative publicity and adversely affect our reputation. Any loss of consumer confidence in our product ingredients or in the safety and quality of our products would be difficult and costly to overcome."<sup>105</sup> It is apparent from this disclosure that companies must consistently maintain high food safety standards while simultaneously adapting to consumer trends. In addition, Hillshire Brands stated that, due to the recently enacted Food Safety Modernization Act, the company has made capital expenditures to comply with anticipated regulation.<sup>106</sup>

**Value Impact:** Potential problems with food safety and quality present revenue and extraordinary expense risks. Product recalls or cases of food contamination can harm brand reputation, lowering revenues as consumers scale back spending on certain products or brands. This could also damage future revenue growth. More rigorous regulations may require capital expenditures, such as facility upgrades as well as R&D investments to meet stringent safety standards. Frequent food safety cases may result in contingent liabilities and higher cost of capital, while acute, high-impact food safety events could result in insolvency.

## Human Capital

Human capital addresses the management of a company's human resources (employees and individual contractors) as a key asset to delivering long-term value. It includes factors that affect the productivity of employees, such as employee engagement, diversity, and incentives and compensation. It can also affect the attraction and retention of employees with specific talent, skills or education in highly competitive or constrained markets. It also addresses the management of labor relations in industries that rely on economies of scale and compete on the price of products and services. Lastly, it includes the management of the health and safety of employees and the ability to create a safety culture for companies that operate in dangerous working environments

Animal production and processing is perilous, and exposes workers to dangerous machinery, chemicals, emissions and waste, and transportation hazards. A strong company safety culture is critical to proactively guard against accidents, protect employee health and safety, and to create a culture of safety for employees at all levels of the organization, which can directly influence the financial results of its operations.

## Workforce Health & Safety

U.S. Bureau of Labor Statistics (BLS) data indicates that the meat & poultry industry has relatively high injury rates compared to other industries. Common hazards include falls, transportation accidents, heat, asphyxiation, and machinery injuries.<sup>107</sup> Industry safety data indicates persistently high accident and fatality rates, despite advances in safety technology and awareness.

Exposure to hazardous air emissions including particulate matter dust may increase the risk of chronic illnesses, while workers can fall ill from pathogens when handling meat or animal waste. Furthermore, the use of antibiotics in animal production may contribute to the emergence of antibiotic-resistant pathogens in the workplace, possibly resulting in acute or chronic worker illnesses.<sup>108</sup>



Company health and safety performance can be analyzed in a cost-beneficial way internally and externally through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Total Recordable Injury Rate, Fatality Rate, and Near Miss Frequency Rate; and
- Description of practices to monitor for and mitigate chronic and acute respiratory conditions

**Evidence:** According to data from the BLS, the animal production industry's (NAICS 311) illness and injury incidence rate was 6.2 per 100,000 full-time equivalent U.S. workers in 2012, the highest of all U.S. industries. The industry experienced 150 fatalities in 2012, 21.7 percent of the total fatalities for the BLS Natural Resources and Mining sector.<sup>109</sup> Violations of health and safety standards may result in regulatory fines; repeated infractions can result in increased fines. For example, in 2007, OSHA cited Tyson Foods for repeated violations of health and safety codes as a result of the agency's Site-Specific Targeting Program, which inspected facilities in industries with histories of high injury and illness rates, including the Meat, Poultry, and Dairy industry. OSHA proposed fines of almost \$340,000.<sup>110</sup>

Fieldworkers, farmers, and plant workers may also be exposed to harmful chemicals, waste, pathogens, and particulate emissions, which may cause chronic illness. Chronic illness among workers may result in increased healthcare-related expenses for companies. Studies have found that particulate matter emissions from CAFO operations increase workers' risk of developing respiratory ailments, including chronic bronchitis, obstructive airways disease, and interstitial lung disease. Other emissions, including ammonia, can result in fatigue, eye and lung irritation, headaches, nausea, and chest tightness.<sup>111</sup> Hydrogen sulfide, considered by the National Institute for Occupational Safety and Health (NIOSH) to be "a leading cause of sudden death in the workplace," is generated in CAFO manure storage pits. NIOSH has documented cases of worker fatalities due to exposure to hydrogen sulfide in manure pits. Due to the use of antibiotics in animal production, workers may be exposed to antibacterial-resistant pathogens. A study of

airborne concentrations of resistant bacteria at CAFOs found levels of bacteria high enough to present a human health risk in and near CAFO facilities. Further, more than 70 studies have shown negative health outcomes in hog CAFO workers, 25 percent of which experienced forms of respiratory illness. Other studies found decreased respiratory health among workers at caged poultry facilities, and that six or more years of working in poultry facilities placed workers at risk for chronic health problems. These impacts may partly be a result of lax air toxin exposure regulations, as many CAFO operations do not have occupational limits.<sup>112</sup>

**Value Impact:** Violations of health and safety standards could result in monetary and non-monetary penalties and additional costs for corrective actions, with an impact on net profits and contingent liabilities. Employee lawsuits related to both regulated and unregulated but known hazardous substances could lead to similar impacts. Health and safety performance is also material in foreign operations, irrespective of whether local regulations are as stringent as those in the U.S., as it could affect a company's reputation and ability to expand market share and operations. This is especially pertinent in the meat & poultry industry, with its widespread international operations. It can also lead to government sanctions that may impact profits and contingent liabilities.

## Business Model & Innovation

This dimension of sustainability is concerned with the impact of environmental and social factors on innovation and business models. It addresses the integration of environmental and social factors in the value creation process of companies, including resource efficiency and other innovation in the production process. It includes product innovation and efficiency and responsibility in the design, use-phase, and disposal of products. It also addresses management of environmental and social impacts on tangible and financial assets—either a company's own or those it manages as the fiduciary for others.



The Meat, Poultry, and Dairy industry is subject to a high degree of regulatory and social scrutiny. Trends suggest that animal welfare and treatment during production are of increasing concern to consumers. Key factors include the use of Genetically Modified Organisms (GMOs) in feed and the animals themselves, the use of hormones and vaccines, and humane treatment of animals. These factors, if improperly managed, can affect brand reputation and revenue.

Furthermore, climate change is expected to unfavorably affect some of the industry's factors of production, including the cost of feed, water availability, and suitable environments for animal raising. Climate change presents a long-term business challenge that must be met with innovative, adaptive strategies.

These emerging trends, along with higher regulatory requirements and scrutiny, are creating new innovation and business opportunities for the industry.

## Animal Care & Welfare

Consumer and regulatory trends are strategic drivers of demand in the Meat, Poultry, and Dairy industry. Issues concerning animal treatment and the methods by which animals are produced are increasingly under public and regulatory scrutiny. In recent years, consumers have shifted demand away from specific production methods and substances. Key issues include animal welfare, and the use of antibiotics and growth hormones.

In the U.S., farm animals are largely excluded from federal and state animal welfare statutes, including the Animal Welfare Act. Thus, many of the industry's actions pertaining to animal welfare and the use of certain animal raising methods have come after consumer and advocacy group action. The industry's revenues are susceptible to consumer-driven trends.

Company performance in this area can be analyzed in a cost-beneficial way internally and externally through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Percentage of pork production without use of gestation crates; and
- Percentage of cage-free poultry; and
- Percentage of production certified to a third-party animal welfare standard; and
- Percentage of antibiotic-free animal production; and
- Volume of feed that contains sub-therapeutic doses of antibiotics.

**Evidence:** Animal welfare and animal raising present demand-driven and regulatory risks. Increasing consumer preference for reduced hormone and vaccine use, non-GMO crop-based feed, and humane treatment of animals used for food are driving the industry to adopt new welfare and treatment standards.

Modern animal production facilities are highly efficient. Animals are fed and housed in the same facility, in some cases in close proximity to each other. This manner of production can increase the risk of animal diseases and other health effects.

Pharmaceuticals including antibiotics are commonly added to animal feed to increase animal growth. Approximately one-third of antibiotics used in the U.S. annually are destined for animal feed. However, consumers are increasingly concerned with the use of antibiotics in animal production and possible human health consequences. Russia has banned imports of U.S. beef and pork over concerns of the use of Ractopamine, an antibiotic used to increase animal leanness and weight. The drug was approved for swine in the U.S. in 1999.<sup>113</sup> Similarly, concerns over hormone use in U.S. cattle caused the EU to ban all imports beginning in 1988. The ban has since been lifted for hormone-free beef.<sup>114</sup>

The largest recall of meat product in U.S. history, the aforementioned Westland recall, occurred after an undercover video of animal abuse at the company's facilities surfaced. The video showed cows that were unable to walk being pushed and prodded by machines and workers, which caused regulators to become concerned that the animals might have been infected with BSE.<sup>115</sup>

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With regards to GMOs, consumer pushback has stalled private sector attempts to introduce GMO animals into food production. Companies must stay abreast of such consumer trends in order to maintain market share and drive growth. The only GMO animal produced to date is salmon. AquaBounty Technologies is currently seeking FDA approval for its GMO salmon breed, called AquAdvantage. The salmon have been engineered to reach a set weight faster than other breeds of farmed salmon.<sup>116</sup> The company has been seeking approval for the fish since 1993. The FDA has received more than 37,000 public comments during the approval process. It is unclear whether consumers would purchase the fish if it were ever approved.<sup>117</sup>

Top companies disclose demand-driven risks from consumer concerns over animal welfare and production methods. For example, Dean Foods states that, "...consumer preferences related to genetically modified foods or the use of certain sweeteners could result in negative publicity and adversely affect our reputation. Any loss of consumer confidence in our product ingredients or in the safety and quality of our products would be difficult and costly to overcome."<sup>118</sup>

In 2013, The Humane Society of the United States and Green Century Capital Management jointly filed a shareholder resolution with Tyson Foods requesting that the company disclose financial and operational risks stemming from the use of gestation crates to house animals in hog production. The filers were concerned that Tyson's use of the crates threatened the company's reputation and market share as consumers increasingly demand higher welfare standards.<sup>119</sup>

**Value Impact:** Animal welfare and care issues can generate negative publicity, driving consumer demand away from certain products. This directly lowers revenues, and in turn, profitability. Repeated instances of negative publicity could cause a company to lose market share. This could unfavorably affect a company's credit profile. In addition, increasingly stringent animal care and welfare regulations could require changes to animal raising methods, which could raise operating costs or require capital and R&D expenditures. On the other hand, companies utilizing the

most sustainable farming techniques will likely experience a stronger demand for their products which may strengthen their pricing power in the short- to medium term.

### Climate Change Adaptation

Climate change presents a long-term challenge for the Meat, Poultry, and Dairy industry. The global presence of top companies in this industry heightens the probability of diverse physical impacts within operations. Warmer average global temperatures are expected to contribute to a wide variety of climatic outcomes, including variations in precipitation patterns, greater magnitude of temperature extremes, and more frequent severe storms. These climatic outcomes can cause changes in crucial factors of production within this industry, including animal feed crops, grasslands, and water availability. Furthermore, climate change is expected to increase the number and range of animal diseases and pests, while temperatures beyond the normal ranges for animals can affect animal health.<sup>120</sup>

Climate change will likely affect animal products companies both directly and indirectly through the supply chain, as many companies source live animals and animal products externally. In addition, impacts on the quality of grassland pasture could negatively impact the productivity of pasture-fed animals, while increased difficulties cultivating feed crops could raise the price of animal feed. Adaptation to a changing climate is a critical long-term concern for the industry. Investors can benefit from increased disclosure on what climate-change related risks and opportunities companies in the industry face.

Company performance in this area can therefore be analyzed in a cost-beneficial way internally and externally through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Discussion of strategy to manage risks to feed sourcing and livestock production presented by climate change



**Evidence:** Major industry participants currently disclose business risks related to climate change in financial statements. For example, Hillshire Brands Co. discussed the effects of climate change on animal feed supply in its FY2013 10-K, stating that, “climate change could affect our ability to procure needed commodities at costs and in quantities we currently experience and may require us to make additional unplanned capital expenditures.”<sup>121</sup> The primary purchased commodity is animal feed, which, as mentioned above, is a major purchase for the industry. In addition, the negative impacts on pasture quality, as discussed in the Water Management issue, could have a direct impact on animal productivity.

Livestock respond rapidly to temperature changes. Hot and cold extremes can cause animal fatalities, while sustained temperatures outside of an animal’s accustomed range can cause it to expend energy and change feeding habits to maintain constant body temperature, negatively affecting health, and in turn, productivity and reproduction. Heat waves in the central U.S. in the 1990s caused concentrated cattle operations to lose more than 100 head of cattle, while severe winters led to the loss of more than 1,000 head in some feedlots.<sup>122</sup> Higher temperatures caused by climate change are the primary cause of increased the prevalence of mycotoxins in animal feed.<sup>123</sup> During the summer of 2012, as much of the contiguous U.S. was in the midst of the most severe drought in decades, approximately half of all livestock production was in areas of severe to extreme drought, while an additional 18 percent was in areas of moderate drought.<sup>124</sup> The industry will likely face an increasing probability of extreme events as climate change advances.

**Value Impact:** Climate change may disrupt animal production through increased variations in precipitation and temperature, causing animal losses and heightened prevalence of animal diseases. Climate change presents a long-term, chronic risk to the industry’s ability to maintain animal inventories, stable supplies of animals, or animal products for processing. Reduction of inventories can directly lower possible revenues, while decreased supply can raise purchasing costs, lowering margins and profitability.

Meat and poultry products producers able to successfully adapt to climate change challenges are likely to insure competitive advantage and strengthen their risk profile which has a positive long-term impact on cost of capital.

### Leadership & Governance

As applied to sustainability, governance involves the management of issues that are inherent to the business model or common practice in the industry and that are in potential conflict with the interest of broader stakeholder groups (government, community, customers, and employees) and, therefore, create a potential liability, or worse, a limitation or removal of license to operate. This includes regulatory compliance, lobbying, and political contributions. It includes risk management, safety management, supply chain and resource management, conflict of interest, anti-competitive behavior, and corruption and bribery.

The industry’s supply chain is extensive. It includes crop farmers, who provide animal feed ingredients, and other animal producers. Suppliers operate internationally, and generate many of the same environmental and social externalities mentioned in this brief. Climate change is also expected to compromise the production of animal feed. Maintaining strong oversight of sustainability within the supply chain, especially in regions where environmental or labor standards may be incomplete, can mitigate sourcing risks and help protect long-term business value.

### Supply Chain Management

Supply chain management for Meat, Dairy, and Poultry producers includes environmental and social issues that can affect the industry’s sourcing of animal feed and animals. Climate change and water scarcity increasingly affect the production of animal feed and animals. Non-vertically integrated companies source a portion of their inputs from farmers or other corporations that operate farming operations. Managing environmental and social issues within supply chain farms is critical to securing raw materials and reducing the risk

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of cost increases. Key supply chain risks include land management, labor conditions, the use of GMO feed, and environmental impacts of cultivation.

The industry recognizes the risk of environmental challenges in the supply chain, which can have a material impact on raw material availability and prices. By disclosing key risks such as a company's supply chain exposure to water scarcity and environmental externalities, investors may be better able to identify risk exposure and effectively measure the efficacy of a company's efforts to strengthen its supply chain and sustain long term value for shareholders. Company performance in this area can therefore be analyzed in a cost-beneficial way internally and externally through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Percentage of antibiotic-free animal production; and
- Volume of feed that contains sub-therapeutic; and
- Percentage of outsourced production meeting fair labor standards; and
- Percentage of outsourced production meeting animal welfare standards; and
- Percentage of feed sourced from water-stressed regions

**Evidence:** The supply chain presents an operating risk, primarily due to feed purchases. Feed comprises between 20 and 50 percent of the production cost of beef cattle, hogs, and dairy cows.<sup>125</sup> The industry's feed sourcing is a key sustainability issue raised in corporate responsibility reporting. The supply of feed is largely corn-based; in the U.S., 87 percent of corn is grown in areas of high or extremely high water stress, highlighting the challenges and potential supply disruptions for the industry.<sup>126</sup> Climate change is expected to have an impact on the crops that supply the industry's feed. Drought in California has severely stressed the region's feed supply, driving up prices. Alfalfa hay, which is grown in California, saw prices rise by 40 percent between January and July 2014.<sup>127</sup>

Major Brazilian meat, poultry, and dairy producer BRF S.A. stated its supplier criteria in

its FY2013 10-K, highlighting key sustainability issues; "The evaluation process often involves the simultaneous consideration of several important supplier performance attributes that include...the supplier's social and environmental policies and performance."<sup>128</sup> Tyson Foods also aims to select its supply partners through criteria including environmental protection and resource conservation, product safety and quality, animal welfare, labor and human rights, employee health and safety, and business ethics.<sup>129</sup> Similarly, Hillshire Brands is currently evaluating all of its suppliers on key environmental metrics including emissions, water use, and waste management.<sup>130</sup>

Although there is no scientific consensus yet on the possible effects of GMO feed on animal health, some studies indicate that adverse health outcomes can occur. A study conducted at the Institute of Health and Environmental Research in Australia found that GMO feed increased the risk of digestive and reproductive disorders in swine.<sup>131</sup>

In 2014, a shareholder resolution filed with Dean Foods by Mercy Investment Services requested that Dean require its dairy suppliers to regularly report water use, including in feed production, manure management, energy use, and GHG emissions. Dean Foods purchases over \$5 billion worth of unprocessed milk annually from farmer co-ops.<sup>132</sup> The resolution initially received just 4.7 percent of votes, but illustrates shareholder concern with environmental impacts in the supply chain.<sup>133</sup> The company also states that it is in the process of developing animal welfare standards and lifecycle assessments for environmental impacts in its dairy supply chain.

**Value Impact:** Meat & poultry companies rely on stable supplies of agricultural inputs. Agricultural practices with negative environmental externalities can increase the probability of crop failure, and in turn raise purchase costs. Social issues such as labor abuses or community pushback can similarly raise purchase costs if supplies are constrained or truncated due to labor issues. Higher operating costs directly lower cash flows and profits.



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Climate change is also expected to increase the costs of producing animal feed, directly raising feed price volatility, and raising purchasing costs. Recurring supply chain disruptions and higher price volatility could harm a company's credit profile over time.

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## Appendix I Five Representative Meat, Poultry, and Dairy Companies<sup>3</sup>

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<b>Tyson Foods, Inc. [TSN]</b>
<b>BRF SA [BRFS]</b>
<b>Hormel Foods Corp. [HRL]</b>
<b>Dean Foods [DF]</b>
<b>Pilgrim's Pride [PPC]</b>

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<sup>3</sup> This list includes five companies representative of the Meat, Poultry & Dairy industry and its activities. This includes only companies for which the Meat, Poultry, and Dairy industry is the primary industry, companies that are U.S.-listed but are not primarily traded Over-the-Counter, and for which at least 20 percent of revenue is generated by activities in this industry, according to the latest information available on Bloomberg Professional Services. Retrieved on August 5, 2014.



## Appendix IIA Evidence for Material Sustainability Issues

Material Sustainability Issues	Evidence of Interest			Evidence of Financial Impact				Forward-looking Impact			
	HM (1-100)	IWGs*		EI	Revenue / Cost	Assets /Liabilities	Cost of Capital	EFI	Probability/Magnitude	Externalities	FLI
		%	Priority								
Greenhouse Gas Emissions	20				•			Low	•		Yes
Water Management	45				•	•	•	High	•	•	Yes
Land Use & Ecological Impacts	80				•	•		Medium	•		Yes
Food Safety	67				•	•	•	High		•	Yes
Workforce Health & Safety	47				•	•		Low			No
Animal Welfare & Farming Techniques	70				•	•	•	Medium	•	•	Yes
Climate Change Adaptation	43				•	•	•	Medium	•	•	Yes
Supply Chain Management	48				•	•	•	Medium	•	•	Yes

\* The Industry Working Groups for this industry will provide feedback during August and September 2014. The feedback from the IWGs, and a final determination of the strength of the evidence of interest, will be included on this table following the finalization of the vetting process.

**HM:** Heat Map, a score out of 100 indicating the relative importance of the issue among SASB's initial list of 43 generic sustainability issues. The score is based on the frequency of relevant keywords in documents (i.e., 10-Ks, shareholder resolutions, legal news, news articles, and corporate sustainability reports) that are available on the Bloomberg terminal for the industry's publicly listed companies.

**IWGs:** SASB Industry Working Groups

**%:** The percentage of IWG participants that found the issue to be material. (-) denotes that the issue was added after the IWG was convened.

**Priority:** Average ranking of the issue in terms of importance. One denotes the most material issue. N/A denotes that the issue was added after the IWG was convened.

**EI:** Evidence of Interest, a subjective assessment based on quantitative and qualitative findings.

**EFI:** Evidence of Financial Impact, a subjective assessment based on quantitative and qualitative findings.

**FLI:** Forward Looking Impact, a subjective assessment of the presence of a material forward-looking impact.



## Appendix IIB Evidence of Financial Impact for Material Sustainability Issues

Evidence of Financial Impact	Revenue & Expenses							Assets & Liabilities				Risk Profile	
	Revenue			Operating Expenses		Non-operating Expenses		Assets		Liabilities		Cost of Capital	Industry Divestment Risk
	Market Share	New Markets	Pricing Power	Cost of Revenue	R&D	CapEx	Extraordinary Expenses	Tangible Assets	Intangible Assets	Contingent Liabilities & Provisions	Pension & Other Liabilities		
Greenhouse Gas Emissions	•			•		•							
Water Management	•			•		•		•				•	
Land Use & Ecological Impacts	•			•		•	•	•	•	•			
Food Safety	•			•	•	•	•		•	•		•	
Workforce Health & Safety	•						•		•	•			
Animal Welfare & Farming Techniques	•		•	•	•	•			•			•	
Climate Change Adaptation	•			•		•		•				•	
Supply Chain Management	•			•					•			•	

•	Medium impact
•	High impact

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## Appendix III Sustainability Accounting Metrics – Meat, Poultry, and Dairy

SASB accounting metrics are based on absolute data to measure sustainability performance. In addition to the accounting metrics, SASB standards also indicate activity level metrics, which provide context to characterize the scope and scale of each company. These activity level metrics can be used to evaluate the intensity of sustainability performance, when used as normalization factors for the absolute data disclosed in accordance with SASB accounting metrics.

**Table 1. Material Sustainability Topics & Accounting Metrics**

Topic	Accounting Metric	Category	Unit of Measure	Code
<b>Greenhouse Gas Emissions</b>	Gross global Scope 1 emissions	Quantitative	Metric tons CO <sub>2</sub> -e	CN0102-01
	Description of long-term and short-term strategy or plan to manage Scope 1 emissions, emissions reduction targets, and an analysis of performance against those targets	Discussion and Analysis	n/a	CN0102-02
<b>Water Management</b>	Total fresh water withdrawn, percentage recycled, percentage in regions with High or Extremely High Baseline Water Stress <sup>4</sup>	Quantitative	Cubic meters (m <sup>3</sup> ), Percentage (%)	CN0102-03
<b>Land Use &amp; Ecological Impacts</b>	Number of incidents of non-compliance with water-quality permits, standards, and regulations	Quantitative	Number	CN0102-04
	Amount of litter and manure animal waste generated, (1) percentage land-application, (2) percentage lagoon storage	Quantitative	Tons (t), Percentage (%)	CN0102-05
	Percentage of operations that are concentrated animal feeding operations (CAFO) <sup>5</sup>	Quantitative	Percentage by production output (%)	CN0102-06
<b>Food Safety</b>	Number of recalls issues, total weight of product recalled	Quantitative	Number, Tons (t)	CN0102-07
	Number of facilities certified to a Global Food Safety Initiative (GFSI) approved standard <sup>6</sup>	Quantitative	Number	CN0102-08
	List of markets banning import of registrant's products <sup>7</sup>	Discussion and Analysis	n/a	CN0102-09
<b>Workforce Health &amp; Safety</b>	(1) Total Recordable Injury Rate (TRIR), (2) Fatality Rate, and (3) Near Miss Frequency Rate	Quantitative	Rate	CN0102-10
	Description of practices to monitor for and mitigate chronic and acute respiratory conditions	Discussion and Analysis	n/a	CN0102-11

<sup>4</sup> Water risk is as defined by the WRI Water Risk Atlas.

<sup>5</sup> Concentrated animal feeding operation is defined according to EPA criteria.

<sup>6</sup> Schemes that meet GFSI requirements include: British Retail Consortium (BRC), Food Safety Systems Certification (FSSC) 22000, International Features Standard (IFS), Safe Quality Food (SQF), CanadaGAP (Good Agricultural Practices), GlobalGAP, and PrimusGFS.

<sup>7</sup> The scope of bans includes those due to Sanitary and Phytosanitary (SPS) measures. The registrant should disclose, where relevant, the scope of the ban or suspension of sale, the length of time it has been in place, meat/products covered, and the stated reason (e.g. BCE).



Topic	Accounting Metric	Category	Unit of Measure	Code
<b>Animal Care &amp; Welfare</b>	Percentage of pork production without use of gestation crates	Quantitative	Percentage (%)	CN0102-12
	Percentage of cage-free poultry	Quantitative	Percentage (%)	CN0102-13
	Percentage of production certified to a third-party animal welfare standard <sup>8</sup>	Quantitative	Percentage (%)	CN0102-14
	Percentage of antibiotic-free animal production <sup>9</sup>	Quantitative	Percentage (%)	CN0102-15
	Amount of feed that contains sub-therapeutic doses of antibiotics <sup>10</sup>	Quantitative	Tons (t)	CN0102-16
<b>Climate Change Adaptation</b>	Discussion of strategy to manage risks to feed sourcing and livestock production presented by climate change <sup>11</sup>	Discussion and Analysis	n/a	CN0102-17
<b>Supply Chain Management</b>	Percentage of outsourced production from suppliers meeting fair labor standards <sup>12</sup>	Quantitative	Percentage (%)	CN0102-18
	Percentage of outsourced production meeting animal welfare standards <sup>13</sup>	Quantitative	Percentage (%)	CN0102-19
	Percentage of feed sourced from water-stressed regions	Quantitative	Percentage (%)	CN0102-20

**Table 2. Activity Level Metrics**

Topic	Activity Metric	Category	Unit of Measure	Code
<b>Activity Level</b>	Number of processing and manufacturing facilities	Quantitative	Number,	CN0102-A
	Output, by category; percentage outsourced <sup>14</sup>	Quantitative	Tons (t)	CN0102-B

<sup>8</sup> Relevant certifications include: Animal Welfare Approved, 5-Step, Food Alliance, Humane Farm Animal Care, and Global Animal Partnership.

<sup>9</sup> "No hormone" livestock is defined by per USDA documentation requirements for labeling.

<sup>10</sup> The scope of disclosure is restricted to sub-therapeutic doses. A suggested normalization factor for this metric is tons of production.

<sup>11</sup> Risks include but are not limited to disease migration, rise in macroparasites, increased animal stress and slower growth rates, water availability risks, and disruptions to feed supply.

<sup>12</sup> Fair labor standards at a minimum should meet the criteria outlined in SA8000.

<sup>13</sup> The scope includes those standards developed and enforced by registrant, as well as recognized third-party standards.

<sup>14</sup> Categories include beef, pork, poultry, eggs, dairy, other.



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