



An Investor Brief on Impacts  
that Drive Business Risks:

# BEEF

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Ceres



This brief provides a summary of the main environmental and social factors that affect beef production *worldwide*; however, it spotlights key players in the U.S. value chain, and provides examples of actions being taken by companies operating or headquartered in the U.S.

## KEY TAKEAWAYS

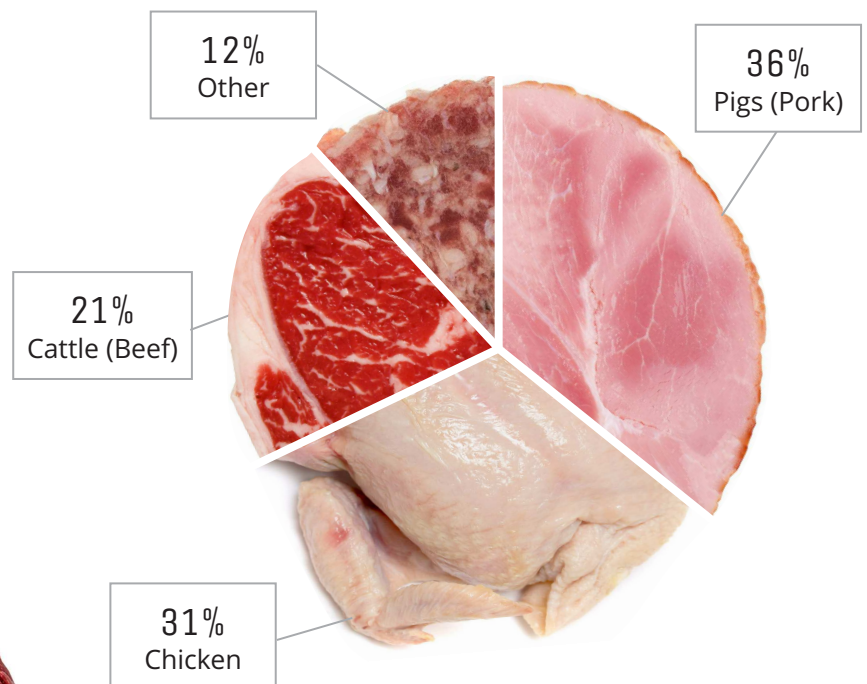
- Demand for beef is expanding, propelled by rising incomes and population growth.
- The U.S. and Brazil are the two largest producers of beef worldwide.
- Beef production generates significant greenhouse gas emissions and wastes that contribute to water pollution, when handled poorly.
- Beef production also uses a lot of water. In the U.S., water availability is one of the key issues affecting beef production.
- The production of beef and cattle feed uses a lot of land and also drives deforestation in countries like Brazil.
- Investors should address risk in the beef supply chain through direct engagement with their portfolio companies and by supporting relevant policies and multi-stakeholder collaborations.

## COMMODITY OVERVIEW

### Beef is the Third Most Commonly Consumed Meat in the World, After Pork and Chicken

Beef products are typically sold as wholesale cuts, ground beef for commercial use or packaged cuts sold in retail outlets.<sup>2</sup>

Beef byproducts, including leather and fat, are used for many non-food items, including candles, crayons, paint and shoes.



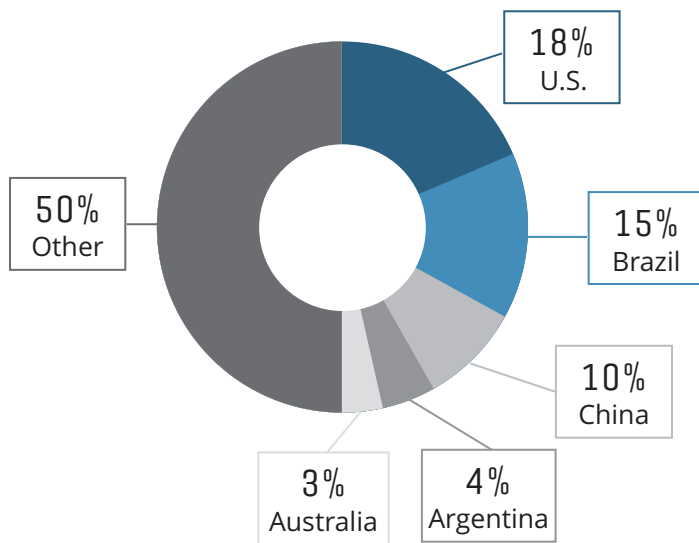
Global Meat Production (based on tonnes)<sup>1</sup>

GLOBAL PRODUCTION DATA

The U.S. and Brazil are the Largest Producers of Beef, Accounting for One-Third of Global Production

On average, less than 5 percent of beef is exported globally, given the heavy weight of beef, trade policies, concern about spoilage and potential cold chain failures.

TOP FIVE PRODUCTION REGIONS<sup>3</sup>



63 MILLION METRIC TONS

Average global beef production<sup>4</sup>

\$158 BILLION

Global production value<sup>5</sup>

5 PERCENT

Proportion of global production exported<sup>6</sup>

Rising Incomes Globally Drive Beef Demand and Production

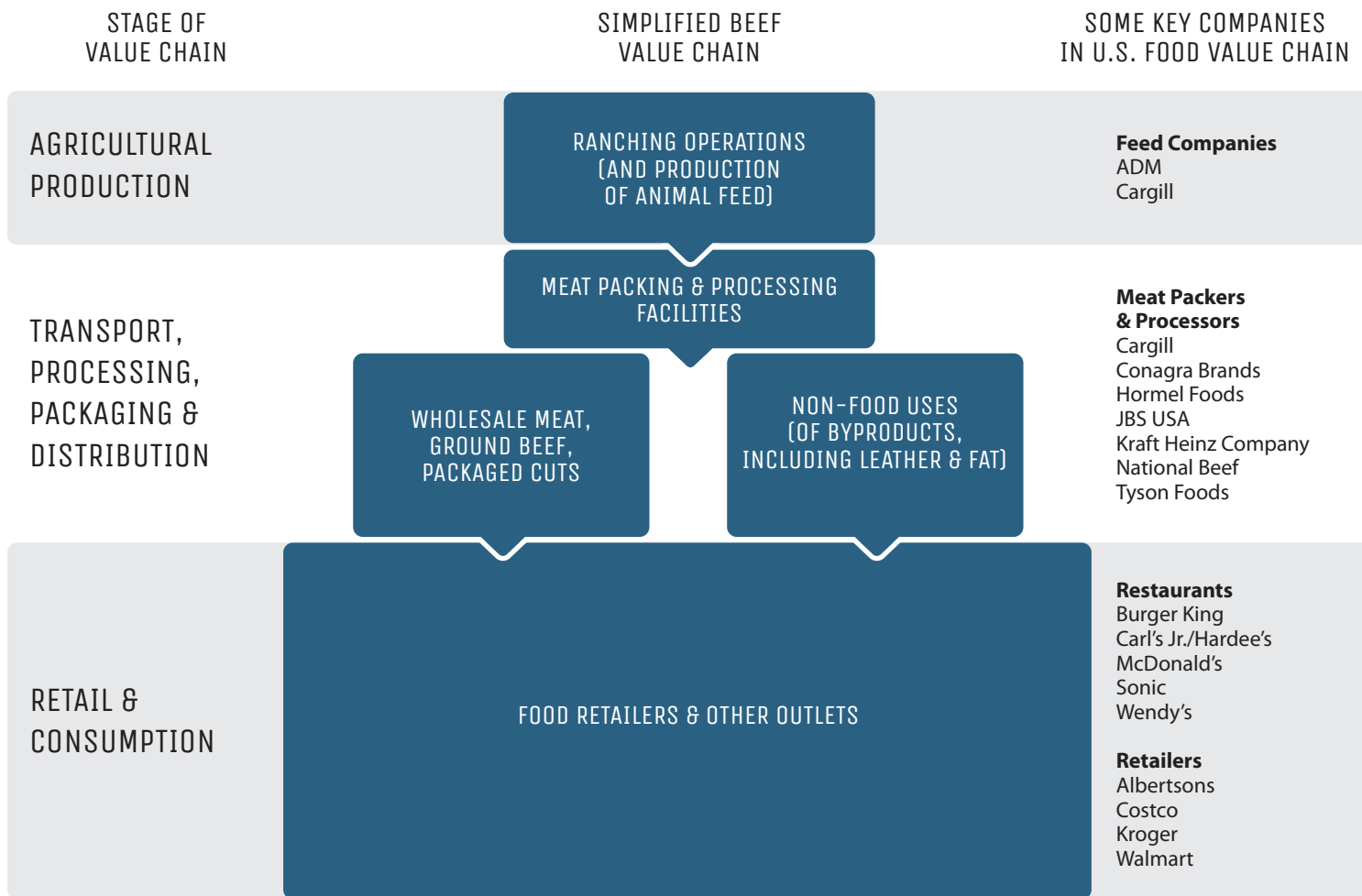
Growth in beef consumption has been dampened recently due to higher beef prices (linked to droughts) and nutritional concerns among consumers. However, globally the demand for beef during the next several decades is expected to continue (by approximately 60 percent by 2050).<sup>7</sup> This increase is driven in large part by a growing global population, rising incomes, urbanization and westernization of diets in developing countries.<sup>8</sup>

BEEF AND DAIRY SECTORS ARE LINKED IN SOME COUNTRIES

*When assessing beef production trends, it is important to keep in mind that in some countries, the beef industry is highly dependent on the dairy sector. This is the case in New Zealand and Europe, for example, where 80 percent of the total beef supply comes from dairy animals (culled dairy cows and surplus male calves).<sup>9,10</sup> By contrast, in the U.S., given abundant grasslands and a large grain supply, the beef industry is not as closely linked to the dairy sector.<sup>11</sup> An estimated 17 percent of all beef calories produced in the U.S. originated in the dairy system.<sup>12</sup>*

THE BEEF VALUE CHAIN

The Beef Supply Chain is Complex, Involving Numerous Steps and Types of Operations





## KEY PLAYERS

The following provides additional information about some of the companies in the U.S. beef value chain. While the focus is on publicly traded companies headquartered in the U.S., some of the companies mentioned are headquartered outside the U.S. and/or are privately held.

### RANCHING OPERATIONS

Before cattle are slaughtered by meat-packing or meat-processing companies, they are raised and handled at three distinct types of ranching operations: cow-calf operations, stocker and backgrounding operations, and feedlot operations.

Feedlots with less than 1,000 head of capacity compose the vast majority of U.S. feedlots, but market a relatively small share of fed cattle. In contrast, lots with 1,000 head or more of capacity compose less than 5 percent of total feedlots, but market 80- to 90-percent of fed cattle.<sup>16</sup> While there are many businesses involved in this sector, the top five states with large cattle feedlots (with a capacity more than 1,000 head) are: Texas, Nebraska, Kansas, Colorado and Iowa.<sup>17</sup>

### FEED COMPANIES

Companies that supply animal feed are important actors in the beef supply chain. Beef raised in the U.S. is primarily finished on grains, including [corn](#), [soybeans](#) and alfalfa (by comparison, beef produced in Brazil is mostly grass-finished).<sup>18,19</sup> Two of the largest feed companies are Archer Daniels Midland (ADM) and Cargill.<sup>20</sup>

### BEEF PACKERS AND PROCESSORS

The U.S. beef packing industry is highly concentrated. In 2014, four companies controlled about 75 percent of the market: Tyson Foods (24 percent), JBS USA (22 percent), Cargill (19 percent) and National Beef (10 percent).<sup>21</sup> Other large companies involved in processing beef further down the supply chain include Hormel Foods, Conagra Brands and The Kraft Heinz Company.<sup>22</sup>

### OVERVIEW: THE STAGES OF BEEF PRODUCTION

*Beef production begins with a cow-calf producer who maintains a breeding herd of cows. Beef cows (and their calves) graze on range and pastureland to maintain themselves. This stage involves very little, if any, grain input.<sup>13</sup> When calves are between six to 12 months of age, they are weaned and leave their ranch or farm of origin. They may be sold at auction, sent to a stocker or backgrounder (if younger or lighterweight and needing to graze longer), or go directly to a feedlot.*

*In a feedlot (sometimes called a feedyard), the animals are fed a grain-based diet. The time cattle spend in a feedlot is often called the “finishing phase.”<sup>14</sup> Some producers choose to finish cattle on grass pasture. The beef derived from these animals is “grass-finished” (sometimes called “grass fed”). Once cattle reach market weight they are sent to a processing facility to be harvested.<sup>15</sup>*

### RESTAURANTS AND RETAILERS

Restaurants and retailers play an important role in the beef value chain. These companies can indirectly influence production practices and supplier standards within their supply chain. Moreover, they are sensitive to external pressures as well as responsive to market trends and consumer preferences.

Roughly two-thirds of the U.S. beef supply goes into foodservice—restaurants and cafeterias—while the other third is sold in supermarkets.<sup>23</sup> The four largest hamburger chains in the U.S. are McDonald’s, Burger King (headquartered in Canada), Wendy’s, Sonic and Carl’s Jr./Hardee’s (privately held).<sup>24</sup> In terms of food retailers, the four largest in the U.S. are Walmart, Kroger, Costco and Albertsons.<sup>25</sup>

ENVIRONMENTAL AND SOCIAL FACTORS



CLIMATE CHANGE



DEFORESTATION



LAND USE & BIODIVERSITY



WATER USE & POLLUTION



LAND RIGHTS



LIVELIHOODS



WORKING CONDITIONS

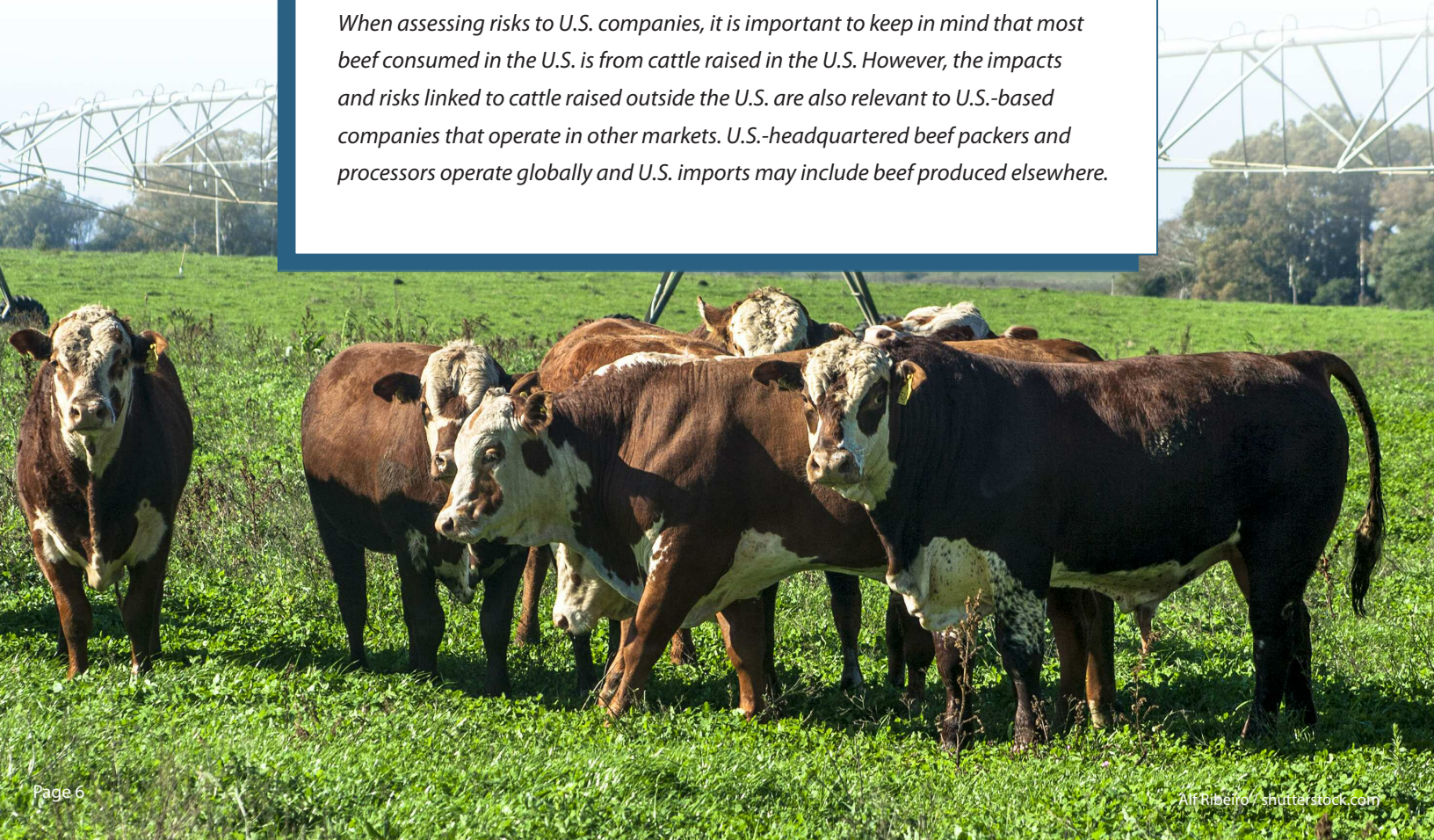


High Impact   
  Medium Impact   
  Low Impact

Globally, the environmental and social issues linked to beef production include deforestation and land conversion, greenhouse gas emissions and water pollution. The scale of the impacts depends on the practices used by ranching operations and feed growers, as well as regional and local conditions.

REGIONAL CONTEXT MATTERS

*When assessing risks to U.S. companies, it is important to keep in mind that most beef consumed in the U.S. is from cattle raised in the U.S. However, the impacts and risks linked to cattle raised outside the U.S. are also relevant to U.S.-based companies that operate in other markets. U.S.-headquartered beef packers and processors operate globally and U.S. imports may include beef produced elsewhere.*



## 1. BEEF CATTLE AND THEIR MANURE CONTRIBUTE SIGNIFICANTLY TO GREENHOUSE GAS EMISSIONS

Beef production has a significant impact on climate change, accounting for 3.9 percent of total manmade greenhouse gas emissions.<sup>26</sup>

- Cattle contribute directly to greenhouse gas emissions when they digest their feed and produce manure. Fertilizers and energy used for growing the animal's feed also contribute to total greenhouse gas emissions.
- More than half of the global emissions from the livestock sector are related to beef and cattle milk (beef accounts for 41 percent; dairy cows for 20 percent).<sup>27</sup>

When calculating a "greenhouse gas footprint" for beef in any particular operation, it is important to understand how the cattle are raised, because their type of feed and other management practices affect the amount and type of greenhouse gas emissions generated.<sup>28</sup>

## 2. BEEF PRODUCTION CONTRIBUTES TO LAND CONVERSION AND SOIL DEGRADATION

Raising beef uses more land—between three to ten times more—than any other meat, including chicken and pork.<sup>29</sup> Permanent pastures<sup>30</sup> (much of it used for cattle) make up 70 percent of all the land used for agriculture.<sup>31</sup> Overgrazing, soil compaction from cow's hooves and poor agricultural practices can degrade topsoil and organic matter, which can take decades or centuries to be replaced.

The impact of cattle production on land conversion is a critical issue when beef is raised in sensitive and important ecosystems, including the North American Great Plains, the savannahs of Southern Africa and the Great Barrier Reef watershed of Australia.<sup>32</sup> In Brazil, one study estimated that 98 percent of the deforestation between 1996 and 2005 was linked to raising cattle and growing soybeans, a key source of animal feed.<sup>33</sup> While significant progress has been made in Brazil in the last decade to cut this high rate of deforestation (for example, through collaborations like the Soy Moratorium), holding the line may be hard and require ongoing action to avoid further clearing of new land.<sup>34</sup>

On the other hand, sustainably managed beef production can achieve conservation benefits in some regions. Grazing can maintain the health of grasslands, improve soil quality with manure, and preserve open space and wildlife habitat. Additionally, carbon is sequestered in the grasses and soils of grazing lands.<sup>35</sup>

### U.S. SPOTLIGHT — ANIMAL DENSITY IMPACTS

*At the start of 2015, there were nearly 30 million beef cattle in the U.S., producing approximately 26 billion pounds of beef. As animal density has increased in the U.S. (about 100 lots contain in excess of 30,000 cattle), so have concerns about air and water quality, occupational health and waste management.<sup>36,37</sup>*



### 3. POOR HANDLING OF MANURE, FERTILIZER AND PROCESSING WASTES POLLUTE LOCAL WATER RESOURCES

Cattle operations can contribute significantly to water pollution when manure and feed crop production are poorly managed. The nitrogen and phosphorus nutrients from the manure and synthetic fertilizers used to grow crops can run off fields or leach into the water. This contributes to “dead zones”<sup>38</sup> that are devoid of life and contaminate local drinking water supplies. In 2014, a toxic algae bloom on Lake Erie caused primarily by agricultural runoff poisoned the water supply for nearly

half a million people in Toledo, Ohio.<sup>39</sup> Surface water and groundwater can also be contaminated by sediment from poor grazing management.<sup>40</sup>

As the global cattle industry expands, so have the beef slaughter and leather industries. Slaughterhouse and tannery waste—rich in organic matter, heavy metals and caustic solutions—is highly polluting when it isn’t treated.<sup>41</sup>

### 4. HIGH WATER DEMAND FOR ANIMAL FEED CONTRIBUTES TO VULNERABILITY DURING DROUGHTS AND GROUNDWATER DEPLETION

Producing beef uses a lot of water—for irrigating pastures, producing feed, watering animals, managing manure and processing products. Though beef’s “water footprint” varies based on production and feeding systems, in most cases the crops used as cattle feed make up a large part of that footprint.<sup>42</sup> Among these different feed crop options, corn and alfalfa use the largest volume of irrigation water.<sup>43</sup>

As water stress increases, the vulnerability of beef production to drought and competition for other uses can increase:

- During the drought in California in 2014, dry pastures and higher hay and silage costs caused \$203 million in revenue losses for the dairy and livestock sector.
- Several states in the U.S., including Colorado, Kansas and Texas, have a large number of cattle feedlots that rely on the already stressed Ogallala aquifer. About one-fifth of all U.S. cattle, corn, cotton and wheat depend on the Ogallala.<sup>44</sup>

It Takes  
**14,964 LITERS OF WATER**

To Produce  
**1 KG BEEF**  
(Weighted Global Average)<sup>45,46</sup>

#### U.S. SPOTLIGHT — OVERALL FOOTPRINT

*In 2014, a study calculated that beef production in the U.S. requires 28 times more land, 11 times more irrigation water, 5 times more greenhouse gases and 6 times more reactive nitrogen, respectively, than other livestock categories (i.e., dairy, poultry, pork and eggs).<sup>47</sup>*



## 5. FARM ACTIVITIES CAN CREATE HAZARDOUS WORKING CONDITIONS AND AIR QUALITY CONCERNS

On ranches and farms, the greatest safety issues arise from operating heavy equipment and handling animals. In 2014, 57 people in the U.S. were killed while working in beef cattle ranching and farming, including feedlots. This represents around 14 percent of fatal injuries taking place in the agricultural sectors.<sup>48</sup> Dust generated by animals and their feed, along with gases from animal wastes can be hazardous to human and animal health.<sup>49</sup> The particulate matter and odor from farm activities can also negatively impact air quality.

Workers in slaughterhouse and meat processing plants can face hazards such as exposure to chemicals and pathogens, traumatic injuries from machines and tools and chronic musculoskeletal injuries. Injury rates are higher than the rest of the manufacturing industry, yet are likely underreported. Workers are often immigrants or refugees and may underreport injuries or illnesses for fear of losing their jobs and livelihoods; companies may underreport due to concerns about potential costs.<sup>50</sup>

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## 6. ANIMAL HEALTH AND WELFARE<sup>51</sup> ISSUES SPUR CONSUMER AND PUBLIC HEALTH CONCERNS

Several animal health and welfare issues can create reputational risks for companies:

- Significant media attention has put the spotlight on “factory farming” and the industrialization of the beef business.<sup>52</sup> A majority of consumers care about animal welfare and report a willingness to pay significantly more for animal products they think are humanely raised, according to surveys in Europe and North America.<sup>53</sup>
- Routine, nontherapeutic use of antibiotics in food animal production is contributing to a growing crisis of antibiotic-resistant infections in humans.<sup>54</sup> By contrast, the therapeutic use of antibiotics is shown to have positive effects on animal health and welfare.
- The use of growth-promoting hormone implants, designed to improve an animal’s weight gain and feed efficiency.<sup>55</sup>

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## 7. HUMAN RIGHTS CHALLENGES COULD CONTRIBUTE TO CONSUMER CONCERN AND REPUTATIONAL RISK

Cattle and beef are reportedly produced with forced labor and/or child labor in a number of countries. U.S. companies face business risks if importing beef from countries where these challenges occur. The only country that is both an important exporter of beef to the U.S. and for which there is documented evidence of forced or child labor is Brazil.<sup>56</sup>

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## 8. SMALL PRODUCERS LACK ACCESS TO RESOURCES, LIMITING THEIR LIVELIHOODS AND ABILITY TO INVEST IN IMPROVED PRACTICES

In some countries, small producers are the largest producers of beef. They often don’t have access to the resources they need to sustain their livelihood and invest in improving farming and cattle raising practices.<sup>57</sup> In Brazil, for example, about 1.8 million ranchers raise cattle, with an average of only 110 heads of cattle per ranch. Small producers also may face other challenges, including limited grazing and resource rights as well as access to credit, fair pricing, extension services and cold chain infrastructure.<sup>58</sup>

## OPPORTUNITIES FOR ACTION

Investors can encourage companies to take the following actions to reduce business risks.

### 1. JOIN MULTI-STAKEHOLDER SUSTAINABILITY EFFORTS

Many players, including buyers, producers, governments, NGOs and communities understand the issues and are collaborating to ensure the long-term sustainability of beef. Investors should encourage companies to join these multi-stakeholder efforts to demonstrate commitment and help accelerate progress. When a company is already involved in such efforts, investors should encourage constructive participation and progress in meeting commitments. This includes supporting and actively participating in the development and use of sustainability standards (see section 4).

One of the most significant efforts focused on beef is the Global Roundtable for Sustainable Beef (GRSB). It was launched in 2012 and approved a definition for sustainable

beef along with global principles and criteria in late 2014. Drawing on this global framework, regional roundtables are developing key indicators and metrics to measure sustainability progress. This includes the U.S. Roundtable for Sustainable Beef (USRSB), Grupo de Trabalho da Pecuária Sustentável (Brazil's sustainable beef roundtable), the Canadian Roundtable on Sustainable Beef (CRSB) and similar groups being formed in other beef-producing regions.

With respect to the U.S. beef value chain, the USRSB will not mandate standards nor verify individual stakeholder performance, but it will identify sustainability indicators, establish verification methodologies, generate field project data to test sustainability concepts and provide a forum for discussion and information exchange.

### ADDRESSING DEFORESTATION ACROSS MULTIPLE COMMODITIES

*Many of the issues affecting beef production affect other commodities as well. Multi-stakeholder efforts that address deforestation related to beef as well as other commodities include:*

- **Tropical Forest Alliance 2020 (TFA)**

*TFA is a global umbrella partnership that brings together governments, private sector and civil society organizations to remove deforestation from palm oil, beef, soybean and pulp and paper. It supports commitments by partners to reduce deforestation in tropical forest countries and was founded in 2012 after The Consumer Goods Forum (CGF)<sup>59</sup> committed in 2010 to zero net deforestation by 2020.*

- **The "Soft Commodities" Compact**

*The compact is a joint initiative of the Banking Environment Initiative (BEI) and CGF, mobilizing the global banking industry to help remove deforestation from soft commodity supply chains and achieve zero net deforestation by 2020.*

- **New York Declaration on Forests**

*In 2014, world leaders (close to 200 governments, financial institutions, companies at all points of the supply chain and influential civil society and indigenous organizations) committed to cut natural forest loss in half by 2020, and to strive to end it by 2030. Concrete commitments and partnerships were also announced and are being implemented.*



## 2. ENGAGE DIRECTLY WITH PRODUCERS

Where companies have visibility into their supply chains, they can work with suppliers and supporting industries (e.g., farm equipment, soil amendment or irrigation companies) to promote better management practices. Management practices that could measurably reduce environmental impacts, include:<sup>60</sup>

- Maintaining vegetative cover
- Avoiding overgrazing
- Protecting riparian areas
- Selecting for cattle that are more efficient
- Reducing waste and disposing of it in the least harmful ways

A number of practices are being explored to reduce methane emissions. These include changing cattle diets to reduce the enteric emissions cattle produce when they eat and improving manure management.<sup>61,62</sup>

## 3. SUPPORT GOVERNMENT POLICIES

Companies can support sustainability policies in producer countries. In the U.S., for example, a number of states are developing policies and plans to improve water quality, such as reducing the run-off from beef cattle operations. In support of Iowa's Nutrient Reduction Strategy, public and private sector organizations,

including agricultural retailers and seed companies, are working together to provide financial support and technical assistance to help develop and demonstrate better water quality practices and technologies.<sup>63</sup>

## 4. ENCOURAGE USE AND DEVELOPMENT OF SUSTAINABILITY STANDARDS

There are several third-party standards relevant for beef production, including:

- USDA Organic program certifies that animals are raised in living conditions that accommodate their natural behaviors, such as grazing on pastures, are fed 100% organic feed and forage and aren't given unnecessary antibiotics or hormones.<sup>64</sup>
- The Animal Welfare Approved as well as Certified Humane Raised and Handled® labels apply to a range of meat products that come from farm animals raised in line with animal welfare and environmental standards.
- The Standard for Sustainable Cattle Production Systems was developed in 2010 by The Rainforest Alliance/ Sustainable Agriculture Network and applies to beef and dairy production systems in the tropics.<sup>65</sup>

Ceres has not evaluated the robustness and effectiveness of these standards but is providing them as options to consider. Ideally, standards are comprehensive and focused on measuring improvements across environmental as well as social issues.





## COMPANIES IN ACTION

- **McDonald's** has made several commitments to improving beef production.
  - The company's 2020 aspirational goal is to support sustainable beef production. In 2011, it helped found the Global Roundtable for Sustainable Beef (GRSB) and in 2016 began to purchase a portion of its beef from verified sustainable sources.<sup>66</sup>
  - McDonald's requires that all facilities providing meat pass a rigorous animal welfare audit. In 2015, 100 percent of the facilities from which the company buys beef, poultry and pork passed audits that complied with McDonald's standards.<sup>67</sup>
  - The fast food chain does not permit the use of animal products sourced from cloned animals.
- **Walmart** has adopted an animal welfare policy and position on responsible use of antibiotics in farm animals in the U.S. It is working to create a dedicated beef supply with environmental specifications by 2023. This supply chain would account for 15 percent of the industry. In Brazil, Walmart worked with suppliers in 2013 to develop a database of ranches that supply beef and rolled out supplier qualifications and continuous improvement plans.<sup>68</sup>
- **Cargill** has committed to reduce in beef production by 20 percent the use of antibiotics medically important to human health. It does not use growth promoting antibiotics—that are medically important—in the cattle it owns or its partnership cattle.<sup>69</sup>





## ADDITIONAL RESOURCES

- The U.S. Department of Agriculture conducts research on multiple commodities, including beef. This includes data on production and consumption, prices and trade and is published through the Economic Research Service, Foreign Agricultural Service and National Agricultural Statistics Service.
- Both [The Sustainability Consortium](#) and [World Wildlife Fund](#) offer high-level insights and analysis about potential risks and opportunities across a number of commodities, including beef.
- [Tackling Climate Change through Livestock: A Global Assessment of Emissions and Mitigation Opportunities](#) (2013) by the UN Food and Agriculture Organization (FAO) provides an in-depth analysis of issues and practical solutions for reducing greenhouse gas emissions related to livestock, including beef cattle. This report provides more recent data than the oft-quoted 2006 FAO report, [Livestock's Long Shadow](#).
- [The Business Benchmark on Farm Animal Welfare Report](#) (2015) provides an annual evaluation of food company's actions on farm animal welfare. In the 2015 report, 90 companies were assessed; of the companies with significant operations in the U.S., McDonald's and Unilever are ranked as having the strongest commitments to farm animal welfare.
- [Good Practice Note: Improving Animal Welfare in Livestock Operations](#) (2014) by the International Finance Corporation (IFC) highlights the business case for improved animal welfare and describes good management practices.
- [Deforestation and the Brazilian Beef Value Chain](#) (2014) by Datu Research explores how beef-focused efforts to combat deforestation are creating unintentional impacts on ranchers' land use decisions, raising the possibility that future deforestation threats will merely shift out of the beef industry and into other sectors.

[Engage the Chain](#) offers briefs on seven other key commodities, a compelling [case](#) for sustainable agriculture and opportunities for action that cut across all types of agricultural commodities.

## ENDNOTES

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