AGRICULTURAL PRODUCTS
Research Brief

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AGRICULTURAL PRODUCTS

Research Brief

SASB’s Industry Brief provides evidence for the disclosure topics in the Agricultural Products industry. The brief opens with a summary of the industry, including relevant legislative and regulatory trends and sustainability risks and opportunities. Following this, evidence for each disclosure topic (in the categories of Environment, Social Capital, Human Capital, Business Model and Innovation, and Leadership and Governance) is presented. SASB’s Industry Brief can be used to understand the data underlying SASB Sustainability Accounting Standards. For accounting metrics and disclosure guidance, please see SASB’s Sustainability Accounting Standards. For information about the legal basis for SASB and SASB’s standards development process, please see the Conceptual Framework.

SASB identifies the minimum set of disclosure topics likely to constitute material information for companies within a given industry. However, the final determination of materiality is the onus of the company.

Related Documents

- Agricultural Products Sustainability Accounting Standards
- Industry Working Group Participants
- SASB Conceptual Framework

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INTRODUCTION

Agriculture’s impacts on the planet are significant. As global population growth and lifestyle changes increase the demand for food, the challenge for the Agricultural Products industry is to meet this demand without jeopardizing natural resources or human health. The key issues facing the industry include climate change impacts on crop yields, environmental externalities resulting from agrochemicals and unsustainable farming practices, ecological impacts of land use and water withdrawal, workforce health, food safety, and responsible supply chain management. Meanwhile, consumer attitudes toward topics such as organic foods, genetic engineering, and agricultural subsidies are shifting because of rising incomes, increased urbanization, and the industrialization of agriculture.

The rise of industrialized farming techniques and technology—including mechanization, genetically modified crops, and chemical application—has altered the industry, driving immense increases in productivity over the past several decades. For example, the Green Revolution in India transformed the country from a net food importer of many agricultural commodities to one of the largest exporters in the world.\(^1\) Since 1960, world wheat and rice production has tripled, and maize production has risen nearly fivefold; per capita agricultural production has risen by 30 percent between 1980 and 2010.\(^2\) Global food production must increase by approximately 60 percent by 2050 from 2005–2007 levels to feed an estimated population of 9.1 billion people. Ninety percent of the rise in crop production is expected to come from greater crop yields and increased production intensity, with the rest predicted to come from an enlargement of arable land.\(^3\) Intensive agricultural production can have impacts on biodiversity, soil, and water and can cause deforestation.

This places agricultural products companies in the sensitive position of having to balance the need to increase productivity and yields, in order to feed a growing population and generate revenues, with the need to lower negative externalities and thereby protect their long-term environmental and social assets and maintain their license to operate.

Management (or mismanagement) of material sustainability issues, therefore, has the potential to affect company valuation through impacts on profits, assets, liabilities, and cost of capital.

Investors would obtain a more holistic and comparable view of performance with agricultural products companies reporting metrics on the material sustainability risks and opportunities that could affect value in the near- and long-term in their regulatory filings. This would include both positive and negative externalities, and the non-

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**SUSTAINABILITY DISCLOSURE TOPICS**

**ENVIRONMENT**
- Greenhouse Gas Emissions
- Energy & Fleet Fuel Management
- Water Withdrawal
- Land Use & Ecological Impacts

**SOCIAL CAPITAL**
- Food Safety & Health Concerns

**HUMAN CAPITAL**
- Fair Labor Practices & Workforce Health & Safety

**BUSINESS MODEL AND INNOVATION**
- Climate Change Impacts on Crop Yields

**LEADERSHIP AND GOVERNANCE**
- Environmental & Social Impacts of Ingredient Supply Chains
- Management of the Legal & Regulatory Environment
financial forms of capital that the industry relies on for value creation.

Specifically, performance on the following sustainability issues will drive competitiveness within the Agricultural Products industry:

- Reducing greenhouse gas (GHG) emissions at crop milling and processing facilities as well as from crop cultivation;
- Reducing total electricity and fuel consumption;
- 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, as well as responding to growing health concerns of the population;
- Ensuring worker health and safety and following fair labor practices;
- Adapting to changing climate by innovating in farming practices and developing more resilient crops;
- Ensuring that the highest environmental and social standards are met within supply chain; and
- Ensuring that business strategy is in line with the long-term interests of society.

**INDUSTRY SUMMARY**

The Agricultural Products industry is engaged in growing, processing, trading, and distributing vegetables and fruits, and producing and milling agricultural commodities, including grains, sugar, consumable oils, maize, soybeans, and animal feed. Agricultural products companies are also involved in wholesale and distribution of products, such as grains and beans. Agricultural products are sold directly to consumers and businesses for use in consumer and industrial products. Vertically integrated agricultural products companies operate farms, crop-processing facilities, and storage and distribution networks.

The Agricultural Products industry generates close to $640 billion in annual revenue globally. Sugar, grain, and oilseed milling represents the largest segment, accounting for $350 billion in revenue, followed by the agricultural products wholesalers, with almost $190 billion in revenue. The largest companies listed on U.S. exchanges, Archer Daniels Midland (ADM) and Bunge, are vertically integrated and operate in both milling and wholesale segments. The next largest companies traded on U.S. exchanges are Ingredion, Seaboard Corporation, Darling International, and Androunds. As of May 2015, there were 15 companies listed on U.S. exchanges for which the Agricultural Products industry is the primary SICS industry. These companies generate approximately $150 billion in revenue. Bunge, ADM, Dole, and other companies in the industry also own, either directly or through subsidiaries, and manage farms and sugar plantations. At the same time, companies may source a substantial part of their agricultural commodities from thousands of third-party growers from various countries, which complicates their ability to control some of the issues discussed in this brief.

The Agricultural Products industry has a global nature. While the U.S., China, India, the E.U., Russia, and Brazil are major producers, products

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1 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.
are traded internationally. Thirty-eight percent of the world’s land area is used for agricultural purposes. According to the United States Department of Agriculture (USDA), the total cropland acreage in the U.S. was 390 million acres in 2012, spread over approximately 1.5 million farms.

The industry produces low-cost agricultural commodities and competes largely on prices. Key factors affecting the industry include weather, grain-based biofuel production, government agricultural policies, exchange rates, and demand from emerging markets. Weather has the most direct influence over crop yields, both via gradual climactic variations and via acute impacts such as floods, droughts, and storms. To limit their exposure to volatile agricultural commodities prices and to enhance margins, companies in the industry engage in hedging activities through exchange-traded futures contracts.

Performance of companies in the Agricultural Products industry is dependent on crop yields and agricultural commodity prices. As mentioned above, extreme weather conditions may significantly reduce growers’ yields and, therefore, sales. While growers can partially offset reduced sales by passing some costs on to consumers via higher commodity prices, in the milling segment, where crop prices are directly related to costs of goods sold (COGS), low crop yields put a pressure on margins as well as reduce sales. Therefore, millers and producers may be able to increase their efficiency though cost management. Where cost of energy is a large portion of COGS, companies can benefit from equipment upgrades and new processing techniques, as well as by relying on renewable energy sources and energy independence.

As the global middle class expands, demand for food and food products is expected to grow, driving increasing production. Demand for staple foods, including rice, maize, wheat, and vegetables, collectively represents two-thirds of the world’s food energy intake and is generally noncyclical. However, certain products used in industrial or fuel applications can exhibit greater demand fluctuations. Long-term global consumer trends indicate increasing expenditures on higher-value foods such as meat, dairy, vegetables, and fruit, and declining spending on staple crop items. This shift is occurring at all income levels and is primarily driven by emerging markets, with their increases in income, urbanization, and female employment.

Consumer preference for organically grown crops is also driving growth in the industry worldwide. The USDA established national standards for organic production and processing in 2002. In 2012, U.S. sales of organic foods reached $28 billion, from approximately $11 billion in 2004. The top two organic food categories are produce and dairy, which represent 43 and 15 percent of organic food sales, respectively. However, total organic-certified cropland made up only 0.8 percent of total U.S. cropland in 2011. The highest adoption has been for fruits and vegetables, and the lowest for feed grains. In the U.S., 10 percent of carrot and lettuce acreage and 5 percent of fruit acreage were under organic management as of 2011, while 0.3 percent of corn acreage and 0.2 percent of soybean acreage were organically managed. Growth in demand for U.S. organic food has outpaced growth in organic farmland during most years since the late 1990s, creating a potential demand-supply gap and an opportunity for further growth in organic-certified cropland. Growth in organic production is a global phenomenon, including in many emerging markets, where specialty crops such as coffee and bananas can achieve high sales in developed markets. Organic foods are typically sold at
higher prices than conventional produce because of the demand-supply gap, greater labor-input costs, and inefficient marketing and distribution chains, as well as the lower volume of products available.\(^{19}\)

Government agricultural policy has a direct financial impact on the industry. Production of some crops is heavily subsidized by governments worldwide in the form of direct payments and crop insurance subsidies. Many governments, including those in the U.S. and the E.U., have paid or continue to directly pay farmers to cultivate certain crops. Also, government biofuel mandates support the demand for some crops, especially maize. This is the case with U.S. federal mandates for ethanol use in transportation fuel.\(^{20}\)

Barriers to entry for small farms are low relative to those for industrial-scale farms, which require significant capital inputs for machinery and land. Profitability is strongly correlated with farm size; operating profit margins and rates of return on assets can be negative for small farms, while large farms are more likely to have positive profit margins.\(^{21}\) Given these low margins, many small farms are able to survive only by receiving off-farm income. On average, 71 percent of such income is from earned sources (e.g., a wage or salary job or self-employment) and the remainder is from unearned sources (e.g., social security, pensions, dividends, interest, and rent).\(^{22}\)

Industry-wide, operating and net profit margins for U.S. publicly listed companies in 2014 were approximately 4.8 percent and 2.7 percent, respectively, close to their 10-year averages.\(^{23}\)

Costs vary depending on the type of crop and the degree of mechanization possible; for example, labor costs for vegetable farming represent a considerable share of costs, while labor costs in grain production are lower because of automation. Key cost drivers include the prices of fertilizers and crop chemicals, seeds, water, labor, electricity, and fuel and oils.\(^{24}\)

A shift toward large, industrial agriculture has been observed in the U.S. and elsewhere. The proportion of production from small, family-owned farms is relatively low today. This shift underlies some of the industry’s sustainability issues, as large farms have adopted more intensive farming techniques that have the potential to magnify environmental and social externalities.\(^{25}\)

**LEGISLATIVE AND REGULATORY TRENDS IN THE AGRICULTURAL PRODUCTS INDUSTRY**

Regulations in the U.S. and abroad represent the formal boundaries of companies’ operations, and are often designed to address the social and environmental externalities that businesses can create. Beyond formal regulation, industry practices and self-regulatory efforts act as quasi-regulation and also form part of the social contract between business and society. In this section, SASB provides a brief summary of key regulations and legislative efforts related to this industry, focusing on social and environmental factors. SASB also describes self-regulatory efforts on the part of the industry, which could serve to pre-empt further regulation.\(^{8}\)

**Global Scope of the Agricultural Products Industry**

Given the global nature of agricultural goods’ production and trade, agricultural products companies are subject to multiple regulatory

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\(^{8}\) 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.
frameworks. In the U.S., the industry is regulated at the federal, state, and local levels. Broadly, regulation addresses the release of substances into air, water, and soil during farming and processing, the safety of consumer foods, and the health and safety of workers.

Regulations may impact the industry across operations, supply chains, and end markets. Environmental and human health regulations are becoming increasingly strict in most markets. Environmental laws in Latin America are evolving rapidly toward higher degrees of regulation and enforcement, as several countries have large agricultural sectors that use an abundance of insecticides, pesticides, fertilizers, and inoculants are widely used. Brazil, reportedly the world’s largest market for pesticides, has banned several substances and, like most other countries in the region, requires the registration of all pesticides and the submission of health and safety data. Environmental and human health regulations are becoming increasingly strict in most markets. Environmental laws in Latin America are evolving rapidly toward higher degrees of regulation and enforcement, as several countries have large agricultural sectors that use an abundance of insecticides, pesticides, fertilizers, and inoculants are widely used. Brazil, reportedly the world’s largest market for pesticides, has banned several substances and, like most other countries in the region, requires the registration of all pesticides and the submission of health and safety data. Meanwhile, several Latin American countries’ constitutions enshrine access to water as a basic human right. While the overall region is rich in freshwater, much of it is concentrated geographically and/or seasonally. Over the past half century, water management in Latin America has shifted from the construction of large infrastructure projects for irrigation and electricity generation to the provision of drinking water and sanitation services to a focus on water conservation, environmental protection, and pollution control.

Legislative and regulatory efforts in other major markets are also relevant. In the E.U., the industry is regulated by the European Commission through the Common Agricultural Policy (CAP). The Commission works with the agricultural ministers of the 28 E.U. countries and the European Parliament to set agricultural policy. The CAP was established in 1962 and was most recently reformed in June 2013. The CAP focuses on three priorities: viable food production, sustainable management of natural resources, and balanced development of rural areas throughout the E.U. The June 2013 CAP reform drives sustainable farming by, for example, linking 30 percent of direct farmer payments to environmentally sound farming practices.

Environmental Regulations

Agriculture can have significant impacts on environmental resources, especially water and land. Irrigated crop production requires large amounts of water, while water contamination arises from the use of fertilizers and pesticides as well as from land erosion. In the U.S., the Clean Air Act (CAA) and Clean Water Act (CWA) regulate air and water emissions from operations. The National Ambient Air Quality Standards regulate emissions of particulate matter, including agricultural dusts. Ambient air emissions from farming practices are covered by Section 110 of the CAA, which requires each state to develop a State Implementation Plan (SIP) for identifying the sources of air pollution and determining the required restrictions for meeting federal air quality standards. Grain terminal elevators with a permanent storage capacity of more than 2.5 million U.S. bushels and grain storage elevators with a capacity of 1 million U.S. bushels are prohibited from discharging any gases with an opacity more than 0 percent and/or particulate matter in excess of 0.023 grams per dry standard cubic meter. Moreover, loading and unloading emissions are covered by the regulations.

The CWA’s Oil Spill Prevention, Control, and Countermeasures (SPCC) Program requires certain facilities, including some farms, to develop and implement plans to prevent oil discharges from reaching U.S. waters or adjoining shorelines. SPCC covers farms that store, transfer, use, or consume diesel fuel, gasoline, lube oil, hydraulic
oil, adjuvant oil, crop oil, vegetable oil, or animal fat; store more than 1,320 U.S. gallons of oil or oil products in aboveground containers or more than 42,000 U.S. gallons in completely buried containers; and could be “reasonably expected to discharge oil to water of the U.S. or adjoining shorelines.”32

Additionally, under the EPA’s Greenhouse Gas Reporting Program (GHGRP), facilities emitting more than 25,000 metric tons of carbon dioxide equivalent (CO₂e) must report their total GHG emissions. The GHGRP is designed to collect data to inform future policy decisions, including programs to reduce emissions.33 Although there is currently no federal carbon dioxide (CO₂) emissions reduction regulation in the U.S., certain states and regions have implemented carbon cap-and-trade programs to reduce emissions. The most prominent example is California’s GHG reduction law, commonly known as AB 32, which took effect in 2012. The program introduced an emissions cap that will be reduced by approximately three percent annually for industrial and other major emitters. Facilities must either reduce emissions or offset them by obtaining emissions credits.34 Milling and processing facilities could be subject to the aforementioned limits because of the relatively high energy intensity of the processes.

Proposed bills to reduce emissions have included the McCain-Lieberman Climate Stewardship Act, which aimed to create a cap-and-trade system but provided an exemption for residential and agricultural areas; the Global Warming Pollution Reduction Act of 2007, which aimed to increase performance standards for electricity generation and motor vehicles; and the American Clean Energy and Security Act of 2009, which aimed to establish an emissions trading plan similar to the E.U.’s trading scheme but provided an exemption for agriculture. Meanwhile, states are taking action; more than half have climate action plans and a growing number have set emissions targets.35

In the Agricultural Products industry, GHG emissions are not limited to those from facilities but also include nonpoint emissions from livestock and soil management activities as well as from deforestation in developing countries, which is often the result of increased land use for agriculture. GHG from fertilizer application, soil management such as tilling, and land clearing can also be significant; typical estimates range from 11 to 15 percent of global emissions.36 Manure management systems that emit methane (CH₄) and nitrous oxide (N₂O) in amounts greater than the reporting thresholds are the only agricultural sources covered by the EPA’s GHGRP. Other agricultural categories are exempt given the difficulty and cost of measuring GHG emissions. At the same time, emissions estimates, rather than their direct measurement, would be a burden to a large number of small entities and would not provide enough certainty, according to the EPA.37

In the U.S., environmental regulations are largely implemented at the state and local levels and are based on federal guidance. Some agricultural operations are exempt from EPA regulations if they are regulated under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).38 The United Nations Programme on Reducing Emissions from Deforestation and Forest Degradation (UN-REDD), launched in 2008, works with indigenous peoples and other forest-dependent communities to implement results-based payments using an online forest monitoring tool.39

Act require progressive growth in biofuel use in U.S. transportation fuels. In the E.U., biofuels are expected to contribute to the region’s goal of using 10 percent renewable energy as a share of the total transportation sector energy use by 2020. The E.U.’s directives ensure the use of biofuels that generate net GHG savings without adversely impacting biodiversity and land use.

Regulations on Food and Worker Safety

The Global Food Safety Initiative (GFSI), an international food safety organization, provides food safety guidance frameworks for crop farming and perishable plant products, including within supply chains. GFSI maintains benchmarks for food manufacturers and farm assurance standards with the goal of ensuring consumer confidence in food safety. Agricultural products companies, as well as retailers, manufacturers, and food service companies, can obtain certification through a third-party audit against certain schemes recognized by the GFSI.

The U.S. Food Safety Modernization Act (FSMA), passed in 2011, gives the FDA increased authority over how foods are grown, harvested, and processed. Shifting the FDA’s focus from responding to contamination to preventing it, FSMA requires farmers and food processors to pay a $500 annual fee to fund increased FDA inspections, enforcement, and food safety research. (The Tester-Hagan amendment exempts local farmers and processors that make less than $500,000 per year and that sell more than 50 percent of their products directly to consumers in the same state and within a 400-mile radius.) The passage of FSMA was prompted by several high-profile outbreaks of food-borne illnesses in the U.S.

The industry is also required to adhere to specific employee health and safety and other labor standards. In the U.S., worker health and safety standards are enforced by the Occupational Safety and Health Administration (OSHA), part of the Department of Labor, and by the EPA. The U.S. Fair Labor Standards Act establishes standards for a minimum wage, overtime pay, record keeping, and youth employment, while the Migrant and Seasonal Agricultural Worker Protection Act provides standards for pay and working conditions for seasonal and migrant farmworkers.

The USDA oversees numerous aspects of the country’s agriculture, including plant health, crop insurance, quality assurance, biotechnology, and regulations on the inspection, distribution, and exportation of grain. The FDA’s Animal and Plant Health Inspection Service regulates the import and export of plants, while the Grain Inspection, Packers and Stockyards Administration regulates the export of grains, oilseeds, and agricultural commodities.

In the U.S., crop chemical use is controlled by FIFRA. Aspects of the law include labeling and registering chemicals, permissible crops and sites for application, environmental impacts, and chemical tolerance levels on products for human consumption.

Evolving Industry Trends

Regulations regarding the importation and/or cultivation of genetically modified crops vary across countries. In the U.S., the FDA and the USDA have actively worked to introduce genetically modified organisms (GMOs) and have not imposed labeling requirements. Meanwhile, the E.U. has generally followed the precautionary principle to prevent and/or delay the approval of GMOs. Elsewhere, GMO regulations tend to depend on a country’s relations with the U.S. and the E.U.; countries that trade with and are
influenced by the U.S. (e.g., Latin America) tend to support GMO crops, while former colonies of Europe (e.g., African countries) and countries that trade with the E.U. tend to be less supportive. Nevertheless, the public perception of GMOs, as well as the regulatory environment, is constantly changing. For example, the bulk of Brazil’s export crops use GMOs, but food products for domestic consumption that contain 1 percent or more GMO derivatives must be prominently labeled as transgenic. Several Andean nations have restricted the use of GMOs: Peru has a 10-year moratorium, and Bolivia and Ecuador have enacted bans. All the major Latin American countries have signed the Cartagena Protocol on Biosafety, which seeks to protect biological diversity from the potential risks posed by GMOs.

Another source of changing regulations on trade policy and agricultural products is the U.S. Food, Agriculture, Conservation, and Trade Act (commonly called the Farm Bill). The Farm Bill, the primary agricultural legislative tool of the federal government, expires and needs to be renewed every five years. It includes provisions for rural development, trade and foreign agriculture, agricultural research, conservation, and renewable energy. One of the most significant changes made in the 2014 Farm Bill was the removal of direct subsidy payments to farmers. The presence or absence of subsidies, as well as the ability to obtain crop insurance, may provide various incentives for farmers using more efficient and effective techniques and equipment that reduces environmental externalities.

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 nonrenewable resources, sustain the economic viability of farm operations, and enhance the quality of life for farmers and society.

SUSTAINABILITY-RELATED RISKS AND 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 capital, company leadership and governance, and a company’s ability to innovate to address these issues are likely to increasingly contribute to financial and business value.

The Agricultural Products industry is a mainstay of developed and emerging markets alike. A dynamic regulatory environment, shifting consumer preferences, extensive use of land and other natural resources, and the impact of climate change on agriculture underlie key sustainability trends within the industry.

Broad industry trends and characteristics are driving the importance of sustainability performance in the Agricultural Products industry:

- **Use of natural resources**: Agriculture is directly dependent on natural capital inputs such as land, energy, and water. Regulations, resource constraints, population growth, and climate change impacts drive the importance of efficiently using such resources. The inefficient use and inept management of such critical resources can lead to higher costs or unstable supplies, affecting the value of agricultural products companies.

- **Environmental and social externalities**: Inadequately growing and processing agricultural products can have
wide-ranging negative environmental and social externalities. These include GHG emissions; air, land, and water pollution; food spoilage; and poor working conditions. Mitigating such impacts is important to protect and enhance shareholder value, given the increasingly stringent environmental and safety regulations and the shifts in consumer preferences. These trends could lower the demand for, or constrain the supply of, agricultural products while also potentially increasing the costs of production.

- **Food supply risks from climate change impacts**: Through various channels, climate change is expected to affect crop yields worldwide. Without adequate risk-mitigation efforts on the part of agricultural products companies and their suppliers, this could have implications for the food supply of a growing population, as well as for industry revenue and profitability.

- **Management of extensive supply chains and governance risks**: The industry’s social license to operate depends on strong corporate oversight of supply chains and on regulatory influence. Companies in the industry can have vast, geographically diverse supply chains. In the eyes of consumers and regulators, there may be little difference between the responsibilities of the agricultural products companies and those of the actors in their supply chains. Each component of the supply chain could be affected by emerging environmental and social regulations, customer pressures, and physical impacts from climate change, posing governance challenges for the industry.

As described above, the regulatory and legislative environment surrounding the Agricultural Products industry emphasizes the importance of sustainability management and performance. Specifically, recent trends suggest a regulatory emphasis on environmental externalities, which will serve to align the interests of society with those of investors.

The following section provides a brief description of each sustainability issue that is likely to have material implications for companies in the Agricultural Products 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 Appendixes IIA and IIB.

Appendix IIA also provides a summary of the evidence of investor interest in the issues. This is based on a systematic analysis of companies’ 10-K and 20-F filings, shareholder resolutions, and other public documents, which highlights the frequency with which each topic is discussed in these documents. The evidence of interest is also based on the results of consultation with experts participating in an industry working group (IWG) convened by SASB. The IWG results represent the perspective of a balanced group of stakeholders, including corporate professionals, investors or market participants, and public interest intermediaries.

The industry-specific sustainability disclosure topics and metrics identified in this brief are the result of a year-long standards development process, which takes into account the aforementioned evidence of interest, evidence of financial impact discussed in detail in this brief, inputs from a 90-day public comment period, and additional inputs from conversations with industry or issue experts.
A summary of the recommended disclosure framework and accounting metrics appears in Appendix III. The complete SASB standards for the industry, including technical protocols, can be downloaded from www.sasb.org. Finally, Appendix IV provides an analysis of the quality of current disclosure on these issues in SEC filings by the leading companies in the industry.

ENVIRONMENT

The environmental dimension of sustainability includes corporate impacts on the environment. This could be through the use of natural resources as inputs to the factors of production (e.g., water, minerals, ecosystems, and biodiversity) or through environmental externalities and harmful releases in the environment, such as air and water pollution, waste disposal, and GHG emissions.

The Agricultural Products industry generates, and is influenced by, a variety of environmental externalities, which create regulatory and operating risks resulting in financial impacts to companies. Crop cultivation and agricultural-products processing release GHGs into the atmosphere. Climate-related regulations aimed at curbing GHG emissions may affect the industry, including through adjustments to farming practices. The industry is reliant on water for both crop irrigation and product processing. Increasing global water scarcity, due to climate change and supply and demand factors, can result in lower water availability; higher water-related costs, such as irrigation pumping; and reduced crop yields. Finally, environmental pollution and habitat degradation caused by agrochemical use, land clearing for cultivation, and certain farmland management practices create regulatory risks and may adversely impact crop yields.

Since the Agricultural Products industry’s value chain is highly dependent on environmental factors, the management of strategic natural resources such as water, energy, land, and biodiversity is a key sustainability and business challenge.

Greenhouse Gas Emissions

Agriculture is a significant contributor to global GHG emissions, particularly extremely potent non–CO₂ emissions. In the Agricultural Products industry, direct GHG emissions occur during different stages of value creation. Unlike other GHG-intensive industries such as manufacturing and energy production, which burn large quantities of fossil fuels and generate CO₂, the majority of emissions in crop cultivation stem from land management practices, including fertilizer application, land clearing, and crop burning, and occur primarily in the form of CH₄ and N₂O. As mentioned in the issue of Legislative and Regulatory Trends in the Agricultural Products Industry, the monitoring and control of such nonpoint emissions is more challenging than that of point sources.

Proposals for regulations that include emissions from crop cultivation sources have been set forth in the U.S., while international organizations, including the United Nations (UN), are developing resources to assist policymakers in regulating agricultural GHG emissions. These actions suggest that future GHG regulations could affect crop cultivation, with direct and indirect impacts (the latter through the supply chain) for the Agricultural Products industry. A heavy reliance on biofuel manufacturers as the main consumers of corn and soy is likely to incentivize growers to reduce their emissions from cultivation. As regulations of lifecycle emissions from renewable fuels become more stringent, biofuel...
manufacturers are likely to switch to farms with lower environmental impacts.

In addition, some of the industry’s major activities that result in point-source emissions fall under the scope of current GHG regulations in the U.S. and abroad. Sugar, grain, and oilseed milling is the largest segment of the Agricultural Products industry globally. Milling grain is an energy-intensive process; energy is used for steam creation and may be generated from coal, natural gas, wood, fuel oil, or electricity. The use of such fuels within companies’ operations can result in Scope 1 GHG emissions, which are subject to regulation in some regions. Many companies in the industry also utilize sugar bagasse (the fibrous portion of the sugarcane that remains after the juice is extracted) and other types of biomass for electricity generation at milling and processing facilities. While emissions from most renewable sources, such as agricultural crops or waste, biodiesel, and fuel ethanol, are currently excluded from compliance obligations, the regulatory environment may become more stringent in the future, with a potential to materially affect agricultural companies.

Less significant sources of GHG emissions in the industry include energy use for operating agricultural machinery, including irrigation pumps. These are primarily CO₂ emissions. Moreover, companies in the Agricultural Products industry may own and operate large fleets of vehicles and vessels. Emissions related to crop transportation are discussed in the issue of Energy & Fleet Fuel Management, below.

Agricultural companies involved in crop cultivation are reducing their nonpoint emissions by switching to more advanced farming practices that help them reduce the amounts of fertilizers and pesticides used without affecting yields. At the same time, the use of renewable sources of energy and the reduced reliance on grid electricity may deliver substantial cost savings as well as decreased risk of exposure to evolving regulations and volatile energy prices.

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

- Gross global Scope 1 emissions;
- Biogenic CO₂ emissions; and
- Description of long-term and short-term strategy or plan to manage Scope 1 emissions, emission-reduction targets, and an analysis of performance against those targets.

Evidence

The broader agricultural sector, including livestock production, is the largest contributor to non-CO₂ anthropogenic GHG emissions, generating about 54 percent of such emissions in 2005 globally. Methane (CH₄) and N₂O are the primary GHGs generated from agriculture and are, respectively, 25 times and 310 times more potent GHGs than CO₂. Emissions from crop cultivation stem primarily from agricultural soil management and land use changes, and to a lesser extent from agricultural machinery.

Agricultural soil management, which includes the use of fertilizers and tillage practices, contributed 74.8 percent of the total U.S. N₂O emissions in 2012. This is largely due to the amount of nitrogen-based fertilizers that are applied to increase crop yield. From 2005 to 2030, global agricultural N₂O emissions are expected to rise by 35 percent, to 2,483 million tons of CO₂e—or 35.8 percent of agriculture’s total GHG emissions—after rising by 11 percent between 1990 and 2005. The rise in synthetic fertilizer use...
and agricultural acreage is the primary driver of this increase.  

Land management practices correlate with N₂O emissions and CO₂ sequestration. Techniques such as slow-release fertilizers, conservation tillage, manure application, nitrification inhibition, and fertilizer-application timing can significantly reduce the amount of nitrogen emissions. Carbon can be sequestered within organic matter in soils; however, there are trade-offs involved. Although soil sequestration can be used to store CO₂, it may result in a rise in N₂O emissions, given the increased volume of decomposing organic matter.

Land clearing for crop production is another major GHG source globally, particularly in developing countries with considerable forest resources. Mature forests store significant amounts of carbon absorbed from the atmosphere in wood, leaves, and soil. Deforestation contributes to 15 percent of global GHG emissions. Worldwide demand for palm oil, an important oilseed crop produced by many companies in the Agricultural Products industry, has led to widespread forest clearing and peatland burning to create plantations in Indonesia. As a result, Indonesia is now one of the top GHG emitters in the world.

According to the USDA, reforestation represents the greatest potential carbon sink because of the large tracts of land currently under cultivation and the storage potential of forests. Reforestation offset 13.5 percent of total U.S. GHG emissions in 2012. However, the expected rise in food demand in the coming years makes wide-scale reforestation difficult. International groups are working to address GHG emissions from land clearing. UN-REDD works to reduce deforestation and forest degradation in developing countries, including from forest conversion to cropland, which is one of the leading causes of deforestation. If the Agricultural Products industry is able to reduce its nonpoint GHG emissions by switching to more sustainable farming practices, it is likely to mitigate aggravating climate change impacts and to ensure greater productivity in the long term.

Analysis by the U.K. Committee on Climate Change suggests that most options for agricultural abatement of emissions are cost-saving. Only three options (new species of nitrogen-fixing plants, anaerobic digestion on pig farms, and covered lagoons and slurry tanks on beef and dairy farms) entail a positive cost. Using production data from farms in and around southwest Minnesota, researchers from the University of Minnesota and Colorado State University showed that limiting nitrogen fertilizer application to optimal levels and minimal tillage practices could reduce GHG emissions by 65 percent.

Whether biofuels actually reduce GHG emissions, compared with fossil fuels, depends on the effects of land use change—i.e., whether natural lands are converted to farmland. The U.S. Energy Independence and Security Act of 2007, which expanded the Renewable Fuel Standard (RFS), requires conventional renewable fuels (e.g., cornstarch ethanol) to reduce lifecycle emissions relative to fossil fuels by at least 20 percent, biodiesel and advanced biofuels to reduce emissions by 50 percent, and cellulosic biofuels to reduce emissions by 60 percent after accounting for indirect land use change. In 2010, the European Commission encouraged governments, industry, and non-governmental organizations to set up voluntary schemes to certify biofuel sustainability under the criteria established by the Renewable Energy Directive. To meet E.U. standards, biofuels must lower GHG emissions by at least 35 percent when compared with fossil
fuels, an amount that will rise to 50 percent in 2017 and to 60 percent in 2018.\textsuperscript{76}

The biofuels industry is one of the main purchasers of corn and soy in the U.S. As of 2013, approximately 43 percent of the corn grown in the U.S. was used for ethanol and dried distillers grains, a coproduct of ethanol production used to feed livestock and poultry.\textsuperscript{77} In 2013, 13 percent of the oil from the soybean crop was used for ethanol, as was 24 percent of the oil from crushed soybeans.\textsuperscript{78} Lower-carbon ethanol may present an opportunity for companies in the Agricultural Products industry to grow revenues because of market price premiums and/or increased market share due to greater demand from biofuel producers. If agricultural products companies can reduce the carbon-intensity coefficient associated with corn production, it will likely reduce the carbon intensity of ethanol, benefiting both farmers and producers. For example, in its FY2013 Form 10-K, Pacific Ethanol stated, “[t]he lower carbon-intensity rating of ethanol we produce or resell is valued in the market by our customers and has enabled us to capture premium prices for our ethanol.”\textsuperscript{79} In addition, more ethanol could be demanded under compliance with the federal RFS—and in California, with the state’s Low Carbon Fuel Standard—if the ethanol emissions are lower than CO\textsubscript{2} emissions.

The industry also contributes to CO\textsubscript{2} emissions through the fossil fuels used to power agricultural machinery. A study published in \textit{Environmental Research Letters} found that emissions from diesel-fueled irrigation pumps in arid regions of China, the world’s second-largest crop irrigator, contribute approximately 33 megatons of CO\textsubscript{2}e annually, or about the same amount of emissions generated by the country of New Zealand. Pumping water for irrigation in China represents a substantial portion of direct energy use on farms.\textsuperscript{80}

GHG emissions present a regulatory risk, as policymakers worldwide continue to advocate for more-stringent emissions reductions. Currently, a number of organizations and policymakers are working to include agricultural sources of emissions into institutional climate change frameworks. For example, as part of its 2007 Climate Change and Emissions Management Act, Canada’s Alberta Province established voluntary N\textsubscript{2}O emissions-offset options for crop farmers. In the U.S., agricultural GHG emitters, including animal and crop agriculture, have opportunities to participate in voluntary emissions reporting and reduction programs; in 2006, the USDA created technical guidelines for a voluntary GHG reporting program for agricultural and forestry sources, which the Department of Energy adopted.\textsuperscript{81} Several climate bills proposed in the U.S. Congress would create a carbon credit system to account for emissions based on agricultural land management. Emitters would receive tradable carbon credits for emissions offsets. However, the incentive-based crediting systems do not force emitters to comply, as there is no penalty for not doing so.\textsuperscript{82} The USDA predicts that gross agricultural revenue from offsets will reach $2.4 billion per year by 2020 and $29.7 billion per year by 2050.\textsuperscript{83}

New GHG regulations may also bring various opportunities to companies in the industry. The Climate Action Reserve, a nonprofit carbon-offset registry for North America, provides opportunities for farmers to earn revenue by reducing the application of synthetic nitrogen fertilizer to corn crops.\textsuperscript{84} The California Air Resources Board is considering a protocol to allow rice farmers in the Sacramento Valley and the Mississippi River Valley to earn revenue for reducing GHGs.\textsuperscript{85}
In fact, while the proposed GHG cap-and-trade schemes in the U.S. would not directly regulate agricultural emissions related to land management and cultivation, the availability of carbon credits could encourage crop producers to utilize GHG mitigation practices. The California Air Resources Board estimates that by 2020, agriculture, including livestock production, could contribute as much as 10 percent, or 17 million metric tons of CO2e, toward the state’s GHG reduction target.

To reduce nonpoint GHG emissions, companies may seek innovative ways of increasing the efficiency of fertilizers. For example, planting crops that utilize nitrogen more effectively would require less nitrogen-based fertilizer to achieve equivalent yields, resulting in lower N2O emissions. At the same time, this would noticeably reduce costs for growers. Cargill’s AgHorizons business, which provides farmers with agronomic solutions to improve yields while reducing required inputs, created detailed field-management plans for fertilizer and chemical use for more than a million acres in Canada. The company also developed variable-rate nutrient maps for 500,000 acres in the U.S. that would help crop producers identify soil fertility levels and determine where fertilizer application is the most beneficial. The maps allowed farmers to reduce the amount of GHG per bushel of crop produced.

A significant portion of direct emissions of companies in the Agricultural Products industry occurs at their milling facilities. As discussed earlier, sugar, grain, and oilseed milling is the largest segment of the industry in terms of revenues generated. Milling is a very energy-intensive process; for example, wet-corn milling accounts for 15 percent of the energy of the entire food industry. Most of this energy, in the form of electricity, steam, or fuel, is used for drying and grinding; fuel is usually used for steam generation or direct drying.

Such emissions pose current and near-term regulatory risks for the industry. According to the EPA’s GHG Reporting Program, direct emissions from the U.S. processing facilities of agricultural products companies amounted to 27 million metric tons of CO2e in 2013, not including emissions from the transportation of agricultural products. In 2013, ADM reported to CDP (formerly the Carbon Disclosure Project) almost 14.8 million metric tons of Scope 1 emissions globally. The same year, Cargill reported approximately nine million metric tons of Scope 1 emissions, and Bunge, a vertically integrated producer of grain and oilseed products, reported 1.5 million. Most of the emissions from all three companies occurred at their U.S. facilities and were in the form of CO2.

California’s Cap-and-Trade Program, adopted in 2011, aims to curb GHG emissions by establishing limited GHG allowances for covered entities and by providing an exchange mechanism for the distribution and pricing of these allowances. Entities that emit 25,000 metric tons or more of CO2e are subject to mandatory reporting regulation and record-retention requirements. Emissions from sources like agricultural crops and waste, biodiesel, and fuel ethanol do not count toward the compliance obligation, but do count toward the reporting threshold. Companies in the Agricultural Products industry generate a significant share of their energy from biomass-derived fuels. While emissions associated with biomass fuels may not currently represent a material risk from the compliance perspective, evolving climate change regulations may become more stringent. Therefore, companies that focus on reducing their total Scope 1 emissions, including those from biomass sources, may be better protected from regulatory risks.
Besides the regulatory risks associated with GHG emissions, companies have an incentive to reduce the cost of purchased fuel and natural gas, which account for a substantial part of their operating expenses. The 2011 Annual Survey of Manufacturers by the U.S. Census Bureau found that the cost of purchased fuel in wet-corn milling accounted for six percent of the total cost of materials and more than nine percent of total value added. The average numbers for all manufacturing industries were 1.3 percent of materials and 1.8 percent of total value. In its FY2014 Form 20-F, Adecoagro stated that fuel constituted 11 percent of its cost of production. Further, the company disclosed risks associated with increasing energy prices and interruptions of the energy supply due to “new laws or regulations, imposition of new taxes or tariffs, interruptions in production by suppliers, imposition of restrictions on energy supply by government, worldwide price levels and market conditions.” Given the volatility in energy prices, companies have an opportunity to significantly reduce their cost of revenue through energy efficiency.

Some companies have achieved energy-cost savings through emissions reductions. In 2013, Associated British Foods, a diversified agriculture, food, and retail company, reported that it was able to reduce its CO₂ emissions by seven percent, from 3.36 to 3.14 million metric tons. The reduction was achieved through the increased use of renewable fuels in the total energy mix and the reduced use of heavy fuel oil. The company puts strong emphasis on carbon emissions reduction and energy efficiency improvements and is working toward energy- and carbon-savings targets under the U.K. government’s Climate Change Agreements.

In general, company financial disclosures allude to institutional and policy efforts to address GHG emissions, including some of the key channels of impact discussed above. In its FY2013 10-K, Bunge stated, “[t]he imposition of regulatory restrictions on greenhouse gases could … affect land-use decisions, the cost of agricultural production, and the cost and means of processing and transport of our products, which could adversely affect our business, cash flows, and results of operations.”

Value Impact
More stringent GHG regulations that include crop cultivation in their scope present risks and opportunities for the Agricultural Products industry. Regulation could require cultivation practices that produce less GHG emissions, such as reduced nitrogen fertilizer use, which in turn could adversely impact yields. Diminished yields could reduce salable products, resulting in lower revenues. At the same time, regulatory compliance can increase the costs of doing business, lowering operational efficiency, particularly for those companies not adept at or face difficulties in managing GHG reductions. Conversely, GHG reductions could be monetized through carbon-offset credits. By reducing GHG emissions at the crop cultivation stage, companies in the industry may benefit from stronger demand from producers of renewable fuels who seek to minimize the lifecycle emissions of their products.

Given that fuel used in milling processes accounts for a large portion of total costs, companies that invest in energy efficiency and manage their energy mix effectively can substantially reduce their operating expenses and improve their profit margins. Firms that currently derive most of their energy from biogenic sources may benefit from the lower risks associated with energy independence, less volatile fuel prices, less frequent supply disruptions, and regulations that exempt biogenic emissions from compliance. On
the other hand, if the regulatory environment were to change toward requiring an accounting of these emissions as Scope 1, agricultural products companies may be materially impacted. To meet more stringent regulatory norms, agricultural products companies may be required to increase their capital expenditures toward new equipment.

While regulatory development in this area is an inherently slow and politically charged 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 toward greater regulation of GHGs.

Energy & Fleet Fuel Management

Sugar, grains, and oilseed milling requires substantial quantities of energy, which is sourced from the direct combustion of fossil fuels and the electrical grid. At the same time, extensive fleets of companies in the wholesale segment require a substantial amount of fuel to operate. Fossil fuel and electrical energy consumption can contribute to environmental impacts, including climate change and pollution. The industry’s energy-intensive production has direct regulatory implications due to Scope 1 GHG emissions from on-site fossil fuel use. The financial risks from the direct use of fossil fuels were discussed earlier in the issue of Greenhouse Gas Emissions.

Furthermore, impacts from purchased electricity consumption, including emissions from utilities, have the potential to indirectly affect the operations of agricultural products companies. Sustainability factors—such as increasing GHG emissions regulations, incentives for energy efficiency and renewable energy, and risks associated with nuclear energy and its increasingly limited license to operate—are leading to increases and volatility in the prices of conventional electricity sources while also making alternative sources cost-competitive.

The trade-off between on-site versus grid-sourced electricity and the use of alternative energy can play an important role in influencing both the cost and reliability of a company’s energy supply, as well as the extent of its direct versus indirect emissions. As climate change regulations become stricter, companies may become accountable for their Scope 1 emissions from biogenic sources of energy. Therefore, it is becoming increasingly important for companies to manage their overall energy efficiency, their reliance on different types of energy and the associated risks, and their access to alternative energy sources.

Moreover, companies involved in the distribution and wholesale of agricultural products may operate extensive logistics networks and own trucks, railcars, and ships, and therefore consume a significant amount of fuel. Transport fuel can exhibit pricing volatility, given global demand-supply dynamics and regulatory pressures related to GHG emissions and other environmental and social externalities, making this an important aspect of operations to manage. While GHG emissions from mobile sources are typically not regulated directly, the cost of transportation fuel can represent a substantial portion of operating expenses.

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

- Operational energy consumed, percentage grid electricity, percentage renewable; and
• Fleet fuel consumed, percentage renewable.

Evidence
Energy is a critical input for the activities of the Agricultural Products industry, including processing and transport. The significant costs of purchased fuels, whose combustion contributes to the industry’s Scope 1 GHG emissions, were discussed earlier in the issue of Greenhouse Gas Emissions. Similarly, the industry accounts for a significant share of purchased electricity consumption relative to other industries and has relatively high costs associated with such purchases. According to the U.S. EPA Annual Survey of Manufacturers, companies in the Agricultural Products industry purchased almost 24 million megawatt-hours (MWh) of electricity for heat and power in 2011—approximately three percent of the total electricity purchased by all manufacturing industries. The total cost of purchased electricity was more than $2 billion for the industry and accounted for 2 to 6 percent of the value added and 1 to 4 percent of the total cost of materials, depending on the activity. In comparison, the average for all manufacturing industries was two percent of the value added and 1.6 percent of the total cost of materials. Wet-corn milling, for example, is the most energy-intensive process when considering value added, while sugarcane and oil refining is the least intensive among the industry’s different activities.100

The Energy Information Agency (EIA) estimates that the retail prices of electricity in the U.S. will increase at a modest pace through 2035. In 2014, the average retail electricity price per megawatt-hour was $110 for commercial use, $72 for industrial use, and $127 for residential use. The EIA’s 2014 Annual Energy Outlook forecasts the 2035 retail electricity prices for commercial, industrial, and residential uses to be $118, $82, and $142, respectively.101

Companies report their Scope 2 emissions from electricity and steam purchase to the CDP. For example, in 2013, ADM had almost 3 million metric tons, Cargill more than 6 million metric tons, and Bunge just under 1.5 million metric tons of Scope 2 emissions. In the same year, global facilities of the three companies purchased 4.8, 9.6, and 1.7 million MWh of electricity, respectively.102

A report on the manufacturing industries by the U.S. Census Bureau estimated that in 2005, production of one hundredweight (cwt)103 of flour required 4 to 7 kilowatt-hours of energy. Using 2005 energy prices, the energy cost of milling one ton of wheat was $4 to $7.104 In milling operations, electrical motors account for about three-quarters of electricity consumption. Therefore, improving the energy efficiency of equipment can help reduce operational costs.103 Maximum-capacity usage in the overall process can reduce energy consumption by 5 to 10 percent, using high-efficiency motors and total efficient maintenance can deliver 2 to 5 percent in energy savings, and optimizing air flow and avoiding leaks in conveying systems can reduce energy use by 10 to 20 percent.104

Companies can generally achieve significant energy-cost savings by reducing inefficiencies at their milling facilities. For example, GE provided its industry clients with equipment and technologies to help reduce their energy use. Modifying the cleaning process of a wet-corn milling plant improved its cleaning quality and process efficiency, which saved the client

100 1 cwt = 50.8 kg.
101 Daily wheat flour production is about 1 million pounds for average mills and 2 to 3.2 million pounds for the largest mills in the U.S.
$300,000 in energy costs and $61,000 in cleaning costs. The return on investment of this project was more than 400 percent, with annual savings of $290,000.\textsuperscript{105}

Aside from increasing electricity prices, the interruption of an energy supply could present significant risks to companies in the Agricultural Products industry, particularly in developing countries, where the existing electricity grid may not be able to meet growing demand. According to Adecoagro’s FY2014 Form 20-F, several of the company’s facilities in Argentina are subject to a quota system aimed at reducing energy use at industrial facilities to ensure adequate supply for residential buildings during peak months of the year. The company therefore experiences frequent electricity disruptions during certain work shifts. Adecoagro tries to minimize these risks by utilizing off-grid sources of energy, such as firewood and liquefied natural gas, and by stocking required supplies in advance of high-demand periods.\textsuperscript{106}

To reduce the risk of energy-supply disruptions, some companies in the industry invest in projects that will help them achieve energy independence. These projects may also improve profitability by hedging against volatile energy prices. For example, Bunge operates cogeneration facilities at its sugarcane mills. By burning sugarcane bagasse, the company generates enough electricity to meet the energy requirement of its mills. At most of its mills, the company also generates extra revenue from selling surplus electricity to the local grid. In 2014, Bunge’s cogeneration capacity was around 314 megawatts, 112 megawatts of which the company was able to resell to third parties, according to its FY2014 Form 10-K.\textsuperscript{107}

The largest companies in the industry are vertically integrated and operate extensive logistics networks for crop transportation. For example, according to ADM’s FY2014 Form 10-K, the company owns approximately 13,500 railcars, 2,100 barges, 1,300 trailers, 300 trucks, and nine oceangoing vessels. It also leases approximately 14,600 railcars, 500 barges, 300 trucks, and 32 oceangoing vessels. The company further stated that its transportation operations are heavily dependent on the costs of diesel and other fuels and may be adversely affected by greenhouse gas regulation or taxation.\textsuperscript{108} Bunge operates and manages approximately 200 ships, which it uses to transport approximately 35 million tons of grains and oilseed and 2.5 million tons of vegetable oils annually.\textsuperscript{109}

Powering such large fleets requires a lot of fuel; companies can realize substantial cost savings by reducing fuel consumption across all transportation means. For example, by optimizing routes from mills to customers’ locations for shipments, Cargill was able to reduce emissions by 252 metric tons of CO\textsubscript{2} during fiscal year 2013, which also indicates a reduction in fuel consumption and therefore fuel costs.\textsuperscript{110} In its 2014 Corporate Responsibility report, ADM stated that investments in fuel efficiency, such as installing auxiliary power units in its trucks, have helped the company save 458,000 gallons of fuel since 2008. Moreover, the company's oceangoing vessels emit 27 percent less CO\textsubscript{2} than conventional bulk carriers do. ADM’s riverboats deploy double-hull protection around the fuel and lubricant bunker tanks, which delivers a 10 to 12 percent fuel savings annually.\textsuperscript{111} To reduce fuel consumption, 25 percent of Bunge’s fleet has run at eco-speed as of July 2013.\textsuperscript{112}

Reducing fuel consumption can therefore have a direct impact on expenses and can help expand profit margins. The SmartDrive Commercial Transportation Fleet Fuel Efficiency Study, issued in 2011 by transportation technology company SmartDrive Systems, found that truck drivers who...
use eco-driving techniques can improve fuel efficiency by an average of 22 percent. That 22 percent improvement means fleet operators could save up to $12,553 in fuel costs per vehicle every year. The study evaluated 695 Class 8 tractor-trailers, heavy-duty trucks, and drivers in a broad range of locations. Eco-driving best practices include accelerating and decelerating smoothly, reducing excess idling, avoiding hard turning, and maintaining a consistent speed.\textsuperscript{113}

**Value Impact**

Energy management primarily impacts current and future costs of operation. Climate regulation and other sustainability factors could result in higher electricity and fuel prices, increasing operating costs for agricultural products companies. Likewise, companies have an opportunity to generate cost savings through improved energy efficiency of equipment at milling and processing facilities and of vehicles and vessels, greater use of electricity produced onsite, and renewable energy. In addition to impacts on operating costs, there could be one-time effects on cash flows through capital expenditures for energy-related projects. Active energy management can also reduce a company’s risk profile and its cost of capital in the face of volatile electricity prices and electricity supply risks.

The probability and magnitude of these impacts could increase in the future as emerging governmental regulations on environmental impacts continue to influence energy costs.

**Water Withdrawal**

The Agricultural Products industry is reliant on water for crop cultivation and product processing, with crop yields dependent on receiving requisite amounts of water. The industry generally accounts for relatively large water withdrawals compared with those for other uses in a community or region. Increasing water stress worldwide is therefore a critical issue for the industry.

While water has typically been a freely available and abundant commodity in many parts of the world, it is becoming a scarce resource. This is due both to increasing consumption from population growth and rapid urbanization and to the potential for climate change to reduce supplies. Furthermore, water pollution can render water supplies unusable or expensive to treat. Based on recent trends, it is estimated that by 2025, 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.”\textsuperscript{114}

In the U.S., allocation of surface waters and groundwater varies according to each state’s regulatory system. Historically, there were three allocation systems: the riparian in the East, where water is abundant; the prior appropriation in the West; and the hybrid system in a few states. According to the prior-appropriation system, the most senior appropriator has the highest priority on water rights and may not have to reduce its water use during a shortage.\textsuperscript{115} The recent drought in California, however, prompted state officials to impose water-use limits on farmers with the strongest water rights.

The water risk for an agricultural products company is determined by its degree of vertical integration, the type of crop(s) it processes or grows, and its operational presence in regions of elevated water stress. For companies with no direct cultivation operations, water risk is present primarily in the availability of water for product processing.
Significant volumes of direct water consumption, particularly in water-stressed regions, introduces operating risks due to reduced availability, higher water prices, and competition with other water consumers for water resources, potentially creating social tensions. Growing water scarcity can therefore affect operating costs, revenues, and the productivity of the assets of agricultural producers. These factors can be exacerbated by inefficient irrigation practices.\textsuperscript{v}

Methods to improve water efficiency in irrigation and processing and agricultural management practices to mitigate adverse effects on crop yields offer the industry opportunities to manage risks, reduce costs, and preserve assets over the long term.

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

- (1) Total water withdrawn and (2) total water consumed, percentage of each in regions with High or Extremely High Baseline Water Stress; and
- Discussion of water withdrawal risks and description of management strategies and practices to mitigate those risks.

**Evidence**

Agriculture accounts for the majority of freshwater consumption worldwide—approximately 70 percent of global freshwater use is directed toward crop irrigation and livestock watering. In the U.S., agriculture consumes approximately 37 percent of total freshwater withdrawals.\textsuperscript{116} In Organization for Economic Cooperation and Development countries, agricultural water withdrawals account for 44 percent of freshwater withdrawals, while in developing nations they may reach more than 90 percent.\textsuperscript{117}

The industry’s reliance on irrigation to support or enhance crop growth presents an operating risk, especially in areas of water scarcity. Substantial increases in water costs or inadequate supplies could result in higher operating costs and reduced crop yields, which could lower potential revenues. Irrigated land is, broadly speaking, more productive than non-irrigated land: Global irrigated cropland totaled 304 million hectares in 2008, accounting for more than 40 percent of crop production on less than 20 percent of cultivated land.\textsuperscript{118} The rise in global crop cultivation for food and energy over the past 50 years has driven the increased use of irrigation to enhance productivity. During that period, global cultivated land area rose by 12 percent, while irrigated farmland nearly doubled.\textsuperscript{119} The UN Food and Agriculture Organization estimates that harvested irrigated land will grow by 17 percent by 2050, leading to an 11 percent increase in water use after accounting for projected improvements in water efficiency.\textsuperscript{120}

The rise in the industry’s water requirements places strain on irrigated lands and other consumers. Exacerbating the issue, agricultural water efficiency tends to be low; by one estimate, 60 percent of the 2,500 trillion liters used globally per year is lost from runoff or evapotranspiration.\textsuperscript{121} High water requirements and inefficiency contribute to a growing problem with water stress, as 15 to 35 percent of water use in irrigation may be unsustainable, with withdrawals exceeding the natural supply.\textsuperscript{122}

\textsuperscript{v} Crops are also dependent on rainfall. Climate change raises the probability of extreme weather events, including droughts and floods, which can adversely affect crop yields. This aspect is covered in the issue Climate Change Impacts on Crop Yields.
Global climate change is expected to increase the frequency and intensity of droughts and other extreme weather events. Droughts and irregular rainfall can increase the need for irrigation in order to limit the impact on crop yields. At the same time, increased water stress due to droughts can reduce the availability of water supplies for irrigation. With the possibility of more frequent and more intense droughts brought on by climate change, local or regional governments could begin restricting water use, or water utilities could increase water rates, affecting large consumers of water. For example, 2014 was the hottest year in California since 1895, with average temperatures 4.5 degrees Fahrenheit above the 20th-century’s average.\textsuperscript{123} Nine million acres of farmland are irrigated in California, which represents 80 percent of all human water use.\textsuperscript{124} The state’s four-year drought prompted the governor, Jerry Brown, to issue an executive order for mandatory statewide water restrictions—the first of its kind in U.S. history.\textsuperscript{125} Water agencies failing to reduce water use by 25 percent will be penalized with $10,000-a-day fines. On June 12, 2015, California ordered the largest water cuts in history by farmers with the state’s senior-water rights in the Sacramento, San Joaquin, and Delta watersheds. Earlier, thousands of farmers with less secure water rights were ordered to stop pumping from the San Joaquin and Sacramento watersheds.\textsuperscript{126}

A study by the University of California, Davis, with assistance from California Department of Water Resources, estimates that the 2014 drought in the state led to a reduction of 6.6 million acre-feet in surface water available to agriculture and resulted in an increase in groundwater pumping by more than 5 million acre-feet. The study further concludes that the resulting net water shortage could cause an $810 million loss in crop revenue and a $203 million loss in livestock and dairy revenue. Additional pumping costs were estimated to amount to $454 million. Overall, the 2014 drought’s cost to the state was $2.2 billion, including $1.5 billion in direct costs to agriculture. Moreover, California lost 17,100 seasonal and part-time jobs.\textsuperscript{127}

The effects of climate change are likely to exacerbate the existing water stress on arable lands; approximately 28 percent of global cropland is in areas of high water stress, according to the World Resources Institute.\textsuperscript{128} For example, almost 90 percent of irrigated maize farmland in the U.S. is in areas of high or severe water stress.\textsuperscript{129} Globally, 56 percent of irrigated crops and 21 percent of rain-fed crops are grown in areas of high or very high water stress.\textsuperscript{130} On an individual company basis, water intensity varies with factors including the type of crop(s) processed and the scale and location of farming or processing operations, which determine the extent of the impact on operations from increasing water stress.

Companies operating in regions of high water scarcity could be at a greater risk for crop failure or water-related disruptions to product-processing operations. Bunge consumed approximately 64 million cubic meters (16.9 billion gallons) of water in 2013. While only 12 of its more than 200 processing facilities are located in areas of water stress of any degree,\textsuperscript{131} Bunge indicates that some of its crop origination occurs in areas of water stress, including Argentina, India, South Africa, Australia, and the U.S.

Companies recognize the costs and risks to operating results from increasing water scarcity. Chiquita Brands reports that the average water footprint of a kilogram of bananas is 400 to 600

\textsuperscript{VI} Based on the World Business Council on Sustainable Development (WBCSD) Corporate Water Tool, version 2012.
liters, and approximately 90 percent of this footprint lies in the cultivation phase. The company found that the “increasing irregularity and intensity of rainfall and droughts caused by climate change have already led to an increased need for irrigation, and potential cost increases,” adding that “water scarcity will probably lead to new regulatory frameworks for water allocation and higher water prices.” 132 Similarly, ADM stated in its FY2013 Form 10-K, “[a]ny major lack of available water for use in certain of the Company’s processing operations could have a material adverse impact on operating results.” 133 According to the Agria Corporation’s FY2014 Form 20-F, “[t]he Australian rural sector is particularly susceptible to drought, which has the potential to result in a material adverse impact on that country’s agricultural revenue.” 134

Companies in the industry have already experienced direct adverse impacts from water shortages, underscoring the importance of water efficiency. A drought in the South-Central region of Brazil in 2010 and 2011 caused a decline in the sugarcane harvest, resulting in lower capacity utilization at BRF’s sugarcane mills and weaker financial results in Bunge’s sugar and bioenergy segment. 135

The 2012 drought in the U.S. caused ADM to nearly lose access to water at some of its processing facilities in Decatur, Illinois, as the city aimed to “lessen the strain” on its water supply. (ADM used to withdraw 14.8 million gallons per day from Lake Decatur). As a result, the company agreed to pay the city $2.5 million to develop alternate water sources in consideration of future water shortages. The agreement allowed ADM to build two underground collector wells to provide water to its North Water Treatment Plant. 136

Several agricultural companies are working to address this issue. In 2013, Chiquita Brands set a goal of reducing the use of freshwater in its operations by 15 percent by 2020 relative to a 2007 baseline. In its FY2013 Form 10-K, the company also reported that it works with third-party growers to reduce their water and pesticide use. 137 Adecoaagro reported that it was working to increase the efficiency of water use and simultaneously decrease the risk of soil erosion. The company’s efforts include rainwater harvesting for certain irrigated crops such as rice, precise leveling of the land to reduce irrigation requirements, and the use of pivot spraying systems and soil moisture sampling for crops such as corn and sunflower seeds. 138 Meanwhile, berry company Driscoll collects data in real-time on water use from its California Central Coast farmers. 139

In addition, food and beverage companies have sent signals to agricultural producers by developing policies and setting goals to source ingredients sustainably. Coca-Cola, PepsiCo, and Unilever have agricultural policies; General Mills and Kellogg have time-bound sustainable sourcing pledges. Meanwhile, General Mills is providing interest-free loans to broccoli and cauliflower growers in Mexico’s Irapuato region to increase the adoption of drip irrigation, contributing to 1.1 billion gallons in annual water savings. 140

Value Impact

Water use can have diverse financial implications. A stable water supply is crucial to crop cultivation and agricultural products processing. Rising water stress related to climate change or other factors increases the risk of crop failure, directly lowering revenues of crop producers and raising raw material costs for crop processors. Furthermore, limited access to water could directly affect a company’s ability to operate processing facilities or could require investment in alternate sources of

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water. Disruptions to operations or crop failure could affect cash flow, and, in turn, negatively affect a company’s credit profile, impacting its cost of capital.

All the aforementioned impacts indicate that the value of water rights for agricultural products companies could significantly increase in the future. As evidence shows, climate change impacts may prompt regulatory authorities to limit companies’ ability to withdraw necessary amounts of water, especially in regions with high or extremely high baseline water stress. These actions are likely to significantly increase the cost of doing business, as exacerbating water stress and irregular rainfall also introduce the need for increased irrigation. To balance the need for additional irrigation and regulatory limitations, companies will have to increase their capital, operating, and R&D expenditures to improve their agricultural processes and to secure alternative water sources.

Unsustainable agricultural practices with respect to water withdrawal and use are likely to have a negative reputational impact on the Agricultural Products industry. As food and beverage companies are becoming more concerned about the environmental performance of their suppliers, agricultural products companies that fail to manage the issue may experience lower demand for their products.

Given the increasing water scarcity and the potential for increases in water prices, the probability and magnitude of the impact of water management on financial results in the Agricultural Products industry are likely to increase in the near term.

Land Use & Ecological Impacts

Land and ecosystems are key natural resources for the Agricultural Products industry. The vast global land footprint of crop cultivation, combined with intensive modern agricultural practices, has diverse ecological impacts that generate regulatory risks and can adversely affect crop cultivation. The primary channels by which the industry can affect ecological resources are through the discharge of agrochemicals, including pesticides and fertilizers, to the environment and through species’ habitat degradation and biodiversity loss resulting from the use of agrochemicals, monoculture cultivation, forest fragmentation, and land clearing. Monoculture, the practice of growing the same crop over large areas each year, is typically pursued by agricultural products companies to try to achieve economies of scale and/or to produce high volumes of profitable crops, while land clearing is pursued to meet growing worldwide consumer demand.

Genetic engineering in agriculture and the development of herbicide-resistant and insect-resistant crops allow for an increased use of fertilizers and pesticides. While there are positive impacts on crop yields, the use of these chemicals also has environmental and social consequences. Several studies link exposure to pesticides to human health hazards. Pesticides are also known to have adverse impacts on land and biodiversity by killing beneficial insects and soil microorganisms. Moreover, excessive application of nitrogen- and phosphate-based fertilizers may result in the eutrophication (nutrient loading) of water systems.

The deterioration of soil quality and the biodiversity loss due to the use of pesticides and fertilizers can diminish agricultural productivity,
which can have an adverse impact on crop yields and the supply of raw materials. Water, air, and soil pollution resulting from the use of agrochemicals also presents a regulatory risk, given the potential bans on the use of pesticides or restrictions on land use in ecologically sensitive areas.  

As the global population continues to grow, the agricultural industry will face further challenges in keeping its land productivity high to satisfy increasing demand. For these reasons, agricultural products companies are faced with the challenge of maintaining high yields in the long term while also reducing environmental externalities associated with fertilizer and pesticide use, monoculture cultivation, forest fragmentation, and land clearing. Companies in the industry can mitigate their operating risks from the abovementioned factors and ensure their long-term growth and profitability by addressing environmental externalities through reduced pesticide and fertilizer use, increased utilization efficiency, and protection of biodiversity, water quality, and sensitive lands. Company performance in this area can be analyzed in a cost-beneficial way through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Descriptions of strategies to manage land use and ecological impacts;
- (1) Volume of wastewater reused and (2) volume of wastewater discharged to the environment;
- Number of incidents of non-compliance with water quality permits, standards, and regulations;
- Amount of fertilizer consumption by (1) nitrogen-based, (2) phosphate-based, and (3) potassium-based fertilizers; and
- Amount of pesticide consumption by hazard level.

**Evidence**

The use of agrochemicals and the ecological impacts created by agricultural products companies have global reach, because of the international nature of many of these companies’ operations. While the factors discussed below are most relevant for companies that own land and have direct control over their farmer suppliers, they are still important for companies without direct control for which supply chain factors may be more applicable.

The world’s population is expected to reach 9 billion people by 2050, and the UN Food and Agriculture Organization estimates that 70 percent more food—or one billion tons of wheat, rice, and other cereals and 200 million tons of beef and other livestock—will be needed from farmers to support this growth. It is a complicated problem to solve, as most of the available farmland is already being cultivated. Moreover, in many cases, cultivation practices can diminish land’s productivity through soil erosion and water waste.

While the “green revolution” and increased use of fertilizers and pesticides helped boost the world’s overall cropland productivity by 150 percent between 1961 and 2009, a recent UN report found that in many areas of the world, the growth rates fell after 2009, mostly because of poor farming practices. According to the report, 25 percent of the world’s farmland is highly degraded, 8 percent is moderately degraded, and 36 percent is stable or slightly degraded with soil erosion, water degradation, and biodiversity loss. Poor land use practices have led to pollution of soil and aquifers in Western Europe, which has resulted in further biodiversity loss.

Modern agriculture is dependent on the application of fertilizers, pesticides, and other
chemicals to boost yields and prevent crop losses. This practice can generate significant environmental externalities, including biodiversity loss, and can lead to regulatory action, including fines or restrictions on the use of certain agrochemicals. The use of these substances presents a challenge for the Agricultural Products industry, as companies must balance agricultural productivity with unintended impacts on the environment. Crop losses due to pests and disease without the use of pesticides range from 30 to 50 percent, depending on the crop, while fertilizer application averaged 133.5 kilograms per hectare of arable land between 2009 and 2011.\textsuperscript{146} Furthermore, crops are sometimes cultivated in regions outside their natural range, and more intensive application of agrochemicals is required to sustain their yields. This increases the risks stemming from environmental pollution, which are addressed below.\textsuperscript{147}

The industry uses various types of fertilizers, and some may be more harmful to the environment than others. For example, the application of nitrogen- and phosphate-based fertilizers and manures can lead to eutrophication in rivers, lakes, and oceans, including algal blooms that can release toxins and cause severe hypoxic water conditions, which can injure or kill aquatic life.\textsuperscript{148} While nutrients contribute to eutrophication of waters, nitrates in drinking water also carry a hazard to humans and animals. 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, which enters the gulf via the Mississippi River.\textsuperscript{149} In terrestrial ecosystems, levels of biologically available nitrogen have doubled since 1960, while flows of phosphorus have tripled.\textsuperscript{150} Nitrate is the most prevalent groundwater contaminant worldwide.\textsuperscript{151}

According to the Center for Sustaining Agriculture and Natural Resources at Washington State University, the breeding of herbicide-resistant crops resulted in a 527-million-pound increase in herbicide use in the U.S. while driving insecticide applications down only by 123 million pounds. Therefore, 404 million pounds, or seven percent, more pesticide was used in the U.S. between 1996 and 2011. Glyphosate-resistant, Roundup Ready (RR) crops provide farmers with a very flexible and forgiving weed-management system. An increase in the use of glyphosate accounted for the largest share of the increase in total herbicide use.\textsuperscript{152} Besides the environmental externalities of increased herbicide use, there is potential for impacts on human health. Not all pesticides can be removed from food before it gets to consumers, leaving so-called pesticide residue.

In 2015, a report by the International Agency for Research on Cancer classified glyphosate, malathion, and diazinon as “probably carcinogenic to humans.” According to the report, there was “limited evidence of carcinogenicity” in humans for non-Hodgkin lymphoma.\textsuperscript{153} The findings prompted strong criticism from agriculture companies, particularly Monsanto, which is one of the largest sellers of glyphosate in the world.\textsuperscript{154} Debate about the carcinogenicity of widely used herbicides like glyphosate could prompt future regulatory action limiting its use, with the potential to impacts the productivity of agricultural products companies.

For companies in the Agricultural Products industry, regulatory risks exist because of concerns over potential biodiversity harm from pesticides use. In 2013, the E.U. adopted a proposal to ban three common pesticides used to control insect populations. A report issued in 2014 by three E.U. farming associations said that the ban could lead to a surge in pests; affect
production of crops, including apples, carrots, and peas; and reduce farming profits by £1.7 billion. Studies have linked the pesticides to a significant decline in bee colonies in North America and Europe, and regulators are concerned because bees are responsible for approximately 80 percent of the pollination of flowering plants, including many crops. The California Beekeepers Association has said that supplies of vegetables and fruits may be harmed if the decline in bee populations continues.

Water quality is also affected by pesticide residue, which adds to the eutrophication of fresh and coastal waters and to development of toxins that eventually could result in the death of various aquatic species. At the same time, as discussed above in the issue of Greenhouse Gas Emissions, soil cultivation eventually results in the release of N₂O.

Recent studies link pesticides with invertebrate biodiversity loss. Researchers at the Helmholtz Centre for Environmental Research in Leipzig, Germany, found that highly contaminated streams in Germany, France, and Australia had up to 42 percent fewer species than uncontaminated waters. Another study suggests that pesticides may accumulate in the environment because their half-life generally ranges between one and four years, meaning that chemicals applied once a year will accumulate.

Companies in the industry discuss the risks associated with agrochemicals in their financial disclosures. In its FY2014 Form 10-K, Anderson stated, “[a]ll products containing pesticides, fungicides and herbicides must be registered with the EPA and state regulatory bodies before they can be sold. The inability to obtain or the cancellation of such registrations could have an adverse impact on our business.” In its FY2014 Form 10-K, Fresh Del Monte Produce stated, “[o]ur business depends on the use of fertilizers, pesticides and other agricultural products...A decision by a regulatory agency to significantly restrict the use of such products that have traditionally been used in the cultivation of one of our principal products could have an adverse impact on us.”

Concerns over the externalities of excessive fertilizer could lead to regulatory action requiring farmers to reduce fertilizer loads. For example, the EPA’s Chesapeake Bay Program controls reductions in nitrogen and phosphorus runoff from nonpoint sources, including agricultural fields. The program emphasizes practicing nutrient management, where fertilizer loads are calculated to meet the requirements of the crops in order to reduce excess fertilizer application. Farmers may receive small financial penalties for not following the requirements.

Contamination of water from pesticide and fertilizer runoff can increase the risks to agricultural products companies that are associated with the issue of Water Withdrawal, discussed previously. Integrated pest management (IPM) is a mitigation measure supported by the EPA that can be used to prevent contamination of water sources. IPM utilizes a variety of insect-, weed-, or disease-control strategies to reduce pesticide use while also minimizing pollution from the use of chemical pesticides. IPM can help companies improve food safety, reduce occupational hazards and environmental risks related to pesticide use, and reduce the pollution and contamination risk of water sources. Moreover, it can help businesses to minimize pest management costs, which are estimated at 4.1 billion annually. Optimizing the use of pesticides contributes to the long-term sustainability of crop production and maintains biodiversity. For example, the use of IPM helped farmers in southern India protect their water...
resources while doubling yields and reducing fungicide use by 78 percent. Another approach to reducing pesticide use is that taken by Indofood Agri Resources, which reports that it is breeding barn owls to control rodents instead of using chemical pesticides. Meanwhile, ADM has a program to audit its participating soybean growers on the responsible use of fertilizers as well as other environmental, legal, and agronomic standards.

Some cherry producers utilize in-the-field microclimate information obtained from monitoring equipment and scouting—one of the IPM techniques. This allows them to change their spraying schedules to meet the current conditions, helping them to reduce the amount of fungicide and insecticide used by 25 percent, saving $40 per acre in pesticide costs. Since pesticide costs are estimated to be 34 percent of a farmer’s variable costs, these costs savings are significant.

Del Monte Foods applies principles of IPM to reduce pesticide use, helping the company minimize the risk of contaminated runoff from fields, protect the health of farmers, reduce biodiversity loss, and decrease the risks of pesticide residue on harvested and processed crops. Some of the practices include application of pest-resistant crops, rotation of crops, and avoidance of sewage sludge and biosolids as fertilizers. The company’s new seed treatment provides 30 days of protection for sprouting green beans and reduces the use of broadcast insecticide by 3,700 gallons per year. Moreover, through its green bean breeding program, Del Monte is developing white-mold-resistant varieties of the crop, which could allow it to reduce the use of fungicide sprays by more than 50 percent over 18,000 acres in the Midwest.

The world’s soil resources are becoming depleted at an accelerating pace. A review paper by the top U.S. soil scientists highlights farming practices such as deep plowing and monoculture as the main reason for erosion and nutrient removal. Several risks are associated with this trend and require improved land management practices. First, soil health is a primary factor for higher yields crucial to support a growing population. Moreover, the top three meters of Earth’s soil store around 2,300 gigatons of carbon, which is more than all the world’s plants and atmosphere combined. Therefore, soil depletion significantly contributes to climate change.

Furthermore, land use requirements of agriculture are a driving force behind deforestation and land being converted to cultivated fields, which in turn adversely impact biodiversity. Approximately 38 percent of the world’s land area is used for agricultural purposes, while agriculture is responsible for approximately three-quarters of global deforestation. With food demand projected to grow by 50 percent by 2030, land clearing for agricultural purposes is likely to continue. In fact, past trends indicate that an additional 10 million square kilometers will be cleared by 2050. Agricultural producers are susceptible to biodiversity changes primarily because biodiversity loss can alter agricultural systems’ susceptibility to pathogens and pests, and can affect the risk of crop failure due to changing environmental factors. Deforestation and land use can directly influence biodiversity, primarily through monoculture cultivation and the physical loss or fragmentation of habitat. In addition, land requirements for crop cultivation can present operating risks to companies if their operations are in or near ecologically sensitive areas.

In 2006, driven by a damaging Greenpeace campaign, major Brazilian soy companies
established a moratorium on forest conversion to prevent deforestation for soy expansion in the Amazon. The moratorium drove down the soy expansion through deforestation from 30 percent to around 1 percent. The soy production almost doubled while deforestation decreased, as farmers planted already deforested lands. In 2008, Brazil’s Central Bank accepted a resolution (Resolution 3.545/2008) forbidding government banks to finance “agriculture and ranching in properties that had fines pending with the environmental authorities.” Similar policies, either enforced by governments or established by the private sector, could materially affect industry players and would prompt companies to adapt their operational practices in consideration of environmental externalities.

In 2013, major agriculture companies such as Cargill, ADM, Bunge, and Monsanto were criticized for their contribution to deforestation of 500,000 hectares of land in Brazil, Argentina, and Uruguay and for planting GMO soybeans in these countries. Moreover, the herbicide use on their crops was found to cause health issues, including neurological diseases.

By maximizing the efficient utilization of land, companies can reduce their need for expansion and increase yields. For example, by growing plants closer together, Del Monte was able to cut pesticide and fertilizer use in its spinach production by 82 and 18 percent, respectively, while reducing cultivated acreage by 42 percent. According to the company, benefits attributed to the high-density agriculture outweigh the initial investment in research.

Companies in the industry discuss the risks associated with land use and ecological impacts in their financial disclosures. Adecoagro acknowledges the importance of biodiversity and land resources to its business, stating, “[n]atural resources are the main foundation of our activities, with land being the most relevant natural resource in our operations.” The company’s environmental management plan, which includes biodiversity factors, is designed to “enhance land productivity and therefore increase land value.” Furthermore, in regard to the accessibility of lands for cultivation, the company stated, “[t]here are ecosystems that we do not consider appropriate for the use of agricultural development, such as heavy forest and key wetlands.” Similarly, Bunge stated, “[o]ur operations are also subject to laws relating to … restrictions on land use in certain protected areas, [and] forestry reserve requirements.” The anticipated growth in agricultural production to meet rising food demand will continue to emphasize the need for efficient management of existing land resources.

Crop cultivation is highly species-concentrated; of the approximately 7,000 plant species cultivated by humans over the history of agriculture, just 12 species supply nearly 75 percent of global food today. While the common modern agricultural practice of monoculture may decrease production costs, given its economics of scale and reduced competition from other plant species, genetically similar plants are also more susceptible to insects, plant diseases, and other variations in growing conditions. This can lower yields and increase the risk of widespread crop failure, potentially canceling out the benefits of lower production costs.

The industry’s environmental externalities, whether from land use changes or pollution, can generate substantial costs at an industry-wide level. According to the World Resources Institute, ecological damage, including erosion, water contamination and eutrophication, and air emissions cost the U.K.’s agriculture industry $2.6
billion in 1996, or 9 percent of the industry’s average annual revenues. 183

**Value Impact**

Ecological externalities of agricultural production can impact companies through two primary channels. First, pollution of water and land resources presents a risk of regulatory fines or restrictions on the use of agrochemicals or land resources, which could have an impact on operating expenditures or production revenues. Second, externalities can adversely affect crop yields, reducing the value of a salable product. Moreover, companies unable to prudently manage agricultural productivity and mitigate long-term environmental impacts may experience devaluation of their land.

Unsustainable land management practices are likely to have a negative reputational impact on the Agricultural Products industry. As food and beverage companies are becoming more concerned about the environmental performance of their suppliers, agricultural products companies that fail to manage the issue may experience lower demand for their products.

Overapplication of fertilizer has negative externalities and could lead to future regulation, bringing on additional expenses and scrutiny, which can harm a company’s social license to operate and may even put that license at risk altogether. With fertilizer as the leading source of GHG emissions from agricultural activity, any regulation on GHG emissions will increase the cost of using fertilizer. As the use of various types of fertilizers may lead to different environmental externalities, the amount of fertilizer consumption by type can help analysts assess a company’s exposure to regulatory risks.

Companies in the Agricultural Products industry that expand their R&D expenditures and adopt the most advanced land use practices may not only protect themselves from the financial risks associated with environmental externalities of crop cultivation but may also capture growth opportunities. Adoption of IPM may allow companies to minimize the amount of fertilizer and pesticide used, which is likely to reduce the cost of doing business. At the same time, reducing the use of pesticides is likely to help companies mitigate regulatory risks, as the use of highly hazardous pesticides furthers the potential for increased scrutiny, given their heightened human and environmental health effects.

As population growth continues, it is becoming more challenging for agricultural companies to balance higher demand for food with more stringent environmental regulations. Therefore, the probability and magnitude of impacts on companies in the industry are likely to increase in the future.

**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.

As main suppliers to the food and beverage industries, agricultural products companies are subject to consumer-driven demand fluctuations. Concerns over food quality and safety can result in regulatory action and damage to brand reputation, as well as affect a company’s social license to operate.
Food Safety & Health Concerns

Agricultural products are sold directly to consumers in raw form (e.g., vegetables) or are further processed into a wide variety of foods. Maintaining product quality and safety is critical, as contamination by pathogens, chemicals, or spoilage presents serious human and animal health risks. Sources of such contamination include bacteria that inhabit the surfaces of fruits and vegetables; molds that develop in grains during unusually wet or dry growing periods; poor farming practices, such as the disposal of solid waste on land; damage and stress during harvesting or storage; malfunctioning or improperly sanitized equipment during processing; misuse of cleaning materials; and rodent and insect infestations.184

Pesticide application may leave residue on the end products. While there is no consensus on the health hazards from pesticide residue, general public perception tends to be negative. Pesticide residue on food is regulated by several government agencies, but independent studies show that current testing processes may not be robust enough to properly identify health risks. The problem is exacerbated for GMOs, as genetically modified crops tend to withstand larger amounts of pesticides during cultivation.

Companies can be impacted by food safety issues through product recalls, damaged brand reputation, and increased regulatory scrutiny. These factors can lower revenues in both the short and long term, through lost sales and 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.

To reduce the risks associated with the issue, agricultural products companies should ensure the highest quality of products at each stage of production. Obtaining food safety certification helps companies in the industry communicate the quality of their products to buyers. Agricultural products companies increasingly work toward ensuring robust evaluation of health and environmental risks and finding effective ways to communicate the safety of their GMO crop to consumers and regulators. To satisfy the growing demand for organic products, firms are switching to organic farming methods within their own operations as well as securing suppliers of non-GMO crops.

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

- GFSI audit conformance: (1) major non-conformance rate and associated corrective action rate and (2) minor non-conformance rate and associated corrective action rate;
- Percentage of agricultural products sourced from suppliers certified to a GFSI scheme;
- Number of recalls issued, total amount of food product recalled; and
- Description of strategies to manage the use of GMOs.

Evidence

Data from the Centers for Disease Control and Prevention suggest that each year in the U.S there are 48 million episodes of foodborne illnesses, 128,000 hospitalizations, and 3,000 deaths. The annual cost of foodborne diseases in direct medical expenses and lost productivity is $5 billion to $6 billion.185 The World Health Organization—whose slogan for World Health Day 2015 was “from farm to plate, make food safe”—
recognizes access to safe food as key to good health. Food safety concerns are prevalent throughout the Agricultural Products industry. In 2012 there were more than 600 food recalls in the U.S. and Canada, most of which were voluntary.

Agricultural products companies address a broad range of risks related to food safety in their SEC filings. For example, in its FY2013 Form 10-K, Bunge stated, “[w]e are subject to food and feed industry risks which include, but are not limited to, spoilage, contamination, tampering or other adulteration of products, product recalls, government regulation, including regulations regarding food and feed safety, nutritional standards and genetically modified organisms (GMOs), shifting customer and consumer preferences and concerns, and potential product liability claims. These matters could adversely affect our business and operating results.”

Agricultural products must meet government food safety standards as well as high quality and safety levels to maintain consumer confidence. In its FY2014 Form 10-K, Del Monte reported, “[o]ur [quality] specifications require extensive sampling of our fresh produce at each stage of the production and distribution process to ensure high quality and proper sizing, as well as to identify the primary sources of any defects. Our fresh produce is evaluated based on both external appearance and internal quality, using size, color, porosity, translucence and sweetness as criteria.”

Cargill, in its FY2014 Annual Report, noted that all food production facilities would receive Food Safety System Certification (FSSC 22000) in 2014 and that certain grain-handling and animal-feed facilities would be certified by 2015. Demand for agricultural products is determined by companies’ ability to obtain aforementioned certification, as many food and beverage companies are seeking certification for their ingredients. For example, Kraft Foods is requiring ingredient suppliers in most of its product categories to achieve GFSI certification by 2015.

Product recalls are a primary channel through which a company’s sales and reputation can be adversely impacted by safety and quality concerns. In a survey of 36 Grocery Manufacturers Association members, 86 percent of whom represented food companies such as Del Monte Foods and Blue Diamond Growers, 81 percent of respondents reported that the financial risk of a recall was “significant” or “catastrophic,” while 58 percent of respondents had issued one or more recalls in the 2007–2011 period. The average financial impact of a recall, including sales losses and direct recall costs, was typically $30 million to $49 million, although 5 percent of recalls had a financial impact of more than $100 million.

Recalls may happen for numerous reasons, including packaging defects, food contamination, spoilage, and mislabeling. A 2006 outbreak of a lethal strain of Escherichia coli (E. coli), O157:H7, in contaminated Dole brand baby spinach, caused the confirmed illness of 205 people and three deaths. The contamination originated during spinach production at facilities operated by Natural Selection Foods, Dole’s supplier. The outbreak caused the FDA to issue a nationwide advisory against consuming raw or packaged spinach. The leafy-green industry ultimately lost an estimated $350 million, as consumption of bagged spinach plunged by more than 70 percent in a matter of weeks. An Ernst and Young survey of top food industry executives found that the greatest risk to financial value from product safety issues is damage to brand reputation. In 2008, a Salmonella outbreak led to more than 1,400 illnesses in the U.S. and caused an
estimated $250 million in losses to the tomato industry.196

Trade restrictions and import bans due to concerns about food safety have been impacting agricultural products companies for decades. In 2015, Malaysia banned the import of two varieties of California apples over concerns they were tainted with the *Listeria* bacteria.197 Two decades earlier, the U.S. banned imports of the 1998 Guatemalan raspberry crop given concerns over cyclosporiasis. In 1996, Guatemala had supplied $22 million worth of raspberries to the U.S., nearly 40 percent of the imported raspberries eaten by Americans, and Guatemalan growers’ voluntary decision to keep their 1997 crop off the U.S. market cost them $12 million in exports.198

Product demand may also be affected by consumer perceptions about the safety of pesticide residue as well as about genetically modified products in general. In a 2013 study of 1,000 Americans conducted by Lindberg International on behalf of Stonyfield Farms, 71 percent reported that they were worried about pesticides in their food and 74 percent wanted to eat foods produced with fewer pesticides.199 Similarly, a 2014–15 survey of 2,000 consumers conducted by Healthline found that 85 percent of consumers want the government to conduct more testing on the impact of GMO products and pesticides in food.200

In the U.S., limits on pesticide residue on food and feed products and commodities are set by the EPA. Testing of the food supply for pesticide residue is a responsibility of the FDA and USDA. Specifically, findings of the Food Safety and Inspection Service (FSIS) and the USDA’s Agricultural Marketing Service are used to provide data on dietary exposure to pesticides over time and to enforce the residue-tolerance levels set by the EPA. In 2014, a report by the Government Accountability Office concluded that testing programs used by the FDA and FSIS are not statistically significant, as they fail to select random samples in the process. Moreover, some of the pesticides with tolerance levels set by the EPA are not being tested by the FDA.201

Converting crops to organic farming methods could provide a revenue opportunity for agricultural products companies. Global demand for non-GMO food and beverage products, estimated at $400 billion in 2012, is expected to double by 2017 at a compound annual growth rate of 15 percent. If this occurs, non-GMO products will make up 14.5 percent of total worldwide food and beverage sales. Companies such as Coca-Cola and Nestlé have introduced non-GMO versions of their products to satisfy consumer demand in Europe, while in the U.S., verification by the Non-GMO Product is backlogged because of a surge of verification requests from manufacturers.202 In its FY2014 Form 10-K, Adecoagro stated, “[t]he use of GMOs in food has been met with varying degrees of acceptance in the markets in which we operate...It is possible that new restrictions on GMO products will be imposed in major markets for some of our products or that our customers will decide to purchase fewer GMO products or not buy GMO products at all, which could have a material adverse effect on our business, results of operations, financial condition or prospects.”203

Ingredion acknowledges the risk of negative public perception toward genetically modified foods in its financial disclosure: “The sale of the Company’s products which may contain genetically modified maize could be delayed or impaired because of adverse public perception regarding the safety of the Company’s products and the potential effects of these products on animals, human health, and the environment.”204
Government approval of the use of GMO plants is varied; major producers, including producers in the U.S. and Brazil, currently allow the use of GMO crops in foods. Meanwhile, while not stating that GMOs are unsafe for human health, more companies are asking suppliers to develop non-GMO options so they can be ready in case labeling requirements become more widespread. Whole Foods has pledged to label all GMO-containing foods that it sells by 2018, while more than 20 U.S. states have by 2016, and Vermont will become the first state to require mandatory labeling. Future GMO regulations and consumer acceptance of GMOs are primary risks to GMO product sales.

As major food retailers such as Walmart, Costco, and Whole Foods are seeing increased consumer demand for healthier and more natural ingredients, they are calling for food companies to use sustainably sourced ingredients. This trend has caused ripple effects through the supply chain. For example, Coca-Cola’s Sustainable Agriculture Guiding Principles recognize that “a healthy agricultural supply chain is essential to the well-being of the communities in which we operate, and is critical to the success of our business.” Chipotle—which aims to procure organic, locally grown ingredients and meat from “naturally raised” animals—in 2013 became the first U.S. chain to label and move toward the elimination of GMO ingredients. Hershey, the largest chocolate manufacturer in North America, in 2015 pledged to switch to non-GMO sugar and soy lecithin in its chocolate kisses and bars.

As this trend among food and beverage companies continues, agricultural products companies will be able to increase their profitability by charging a premium for organic crops. Those companies in the Agricultural Products industry that are able to secure suppliers that grow non-GMO crops are likely to obtain a competitive advantage. For example, ADM, in partnership with Unilever, pays a 10-cent-a-bushel premium to Iowa soybean farms for enrollment in the Field to Market program.

**Value Impact**

Food quality and safety issues can lead to consumer-driven demand changes and regulatory action. Product recalls can harm brand reputation, reduce revenues, and lead to costly fines. Companies that experience frequent or high-profile recalls may experience weaker financial performance, including reduced revenues and costs associated with recalling the product. Poorly performing companies may also open themselves to the risks of lawsuits resulting in costly litigations and settlements. Companies that maintain a strong quality and food safety performance may better avoid costly recalls, and could strengthen their reputation and gain market share from competitors.

Conformance with the GFSI scheme provides a good indication of companies’ performance on the issue, where major non-conformances may indicate systemic governance risks, which could affect risk premiums. High non-conformance rates and low corrective action rates could indicate risks to food safety, which could lead to recalls, lost contracts, and remediation costs. Major non-conformances typically signal a risk of high-impact food-safety events, while minor non-conformances may indicate routine, low-impact manufacturing and operational challenges. Moreover, minor non-conformances may expose findings that, if not corrected, could turn into major non-conformances that present higher-magnitude repercussions.

Social trends indicate that customers are becoming increasingly concerned with the health impacts related to the consumption of GMO
products. As a response to these concerns and changing consumer preferences, food and beverage companies look for opportunities to increase the amount of organic product offerings. Therefore, agricultural products companies able to convert their practices to growing non-GMO crops may capture a larger share of the rapidly growing GMO-free products market.

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, as well as the attraction and retention of employees in highly competitive or constrained markets for specific talent, skills, or education. 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 within companies that operate in dangerous working environments.

In the Agricultural Products industry, human capital is an important input. The industry’s labor force is characterized by a high degree of seasonal and transient employment and by the legal employment of children, and workers are exposed to acute and chronic health hazards. Agricultural occupations are dangerous: acute physical risks stem from exposure to large machinery and heavy vehicle hazards, while exposure to agrochemicals can create chronic health risks. Safety culture is critical to proactively guarding against accidents. In addition, the nature of the industry’s workforce, including employment of migrant and child workers, exposes it to labor-related risks.

Fair Labor Practices & Workforce Health & Safety

Agricultural products companies have diverse operations ranging from crop cultivation to grain milling. The industry’s human capital across these operations can be adversely affected by labor issues in poorly managed operations. Data indicate that the industry has relatively high injury and fatality rates. The physically demanding nature of the work increases the risk of accidents, and the merged nature of working and living conditions for many subsistence farmers and waged workers increases the environmental spillovers from occupational risks. Common hazards include falls, transportation accidents, heat-related illness or injury, asphyxiation, machinery accidents, and hearing loss. Furthermore, workers in both farming and milling are exposed to toxic substances such as agricultural pesticides—whether because of spills, inadequate protective equipment, direct spray, or drift from nearby fields—that can be harmful with long-term exposure. These issues create regulatory risks, including from violations of safety standards, as well as lower productivity, higher health costs, litigation, and reputational risks.

In addition to the hazardous nature of the work, other labor issues of concern in the Agricultural Products industry include fair pay, the rights of migrant workers and children in farmwork, and working and living conditions. In many countries, only some categories of agricultural workers are protected by national legislation, insurance, or workplace injury benefits, and legislation is not consistently enforced.
Child labor is common in farming for many reasons, including historical precedent, limited access to education, poverty, inadequate agricultural technology, and traditional beliefs about the role of children in farming. For example, in colonial America, children played an integral role in the agricultural and handicraft economy, either working on the family farm or being hired out to other farms, and child labor was not controversial.

Migrant workers are also common in farming; each year up to 3 million farmworkers in the U.S. travel to plant, harvest, and pack fruits, vegetables, and nuts. Also, 52 percent of all farmworkers are unauthorized, with no legal status in the U.S. Reasons for migrant work include economic instability, political unrest, population growth, land reform issues, and limited job opportunities in farmworkers’ countries of origin, as well as demand for low-cost labor to fill jobs that are no longer attractive to U.S. citizens because of low wages and/or poor workplace conditions.

Workplace conditions are generally poor, as farmworkers with low levels of literacy and language skills are often unaware of their rights under occupational health and safety laws. In the U.S., only 2 percent of farmworkers are unionize and only 5 percent have completed education past high school. Also, workers may be reluctant to demand improvement in their working conditions because unemployment is high and wages are low, and they may not seek help from government agencies given fears of deportation. Managing the industry’s human capital assets is an important issue, especially in regard to health, safety, and child labor. Developing a strong safety and labor culture, including improved workforce training and incident reporting, can minimize or avoid negative consequences related to workforce management. Company performance in this area can be analyzed in a cost-beneficial way through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Percentage of farms and facilities certified for fair labor practices;
- (1) Total recordable injury rate (TRIR), (2) fatality rate, and (3) near miss frequency rate (NMFR) for (a) direct employees and (b) seasonal and migrant employees; and
- Description of efforts to assess, monitor, and reduce exposure of direct, seasonal, and migrant employees to pesticides.

Evidence

Workers in the Agricultural Products industry are exposed to various safety, health, environmental, biological, and respiratory hazards. The higher-than-average injury and fatality rates in the Agricultural Products industry present regulatory and reputational risks for companies. In 2011, 570 U.S. agricultural workers died from work-related injuries (276 of those were caused by vehicular accidents). This is seven times higher than the overall fatality rate for workers in the private sector. Worldwide, according to the International Labour Organization, more than 170,000 agricultural workers are killed each year, and many accidents, deaths, and occupational diseases go unreported.

According to data from the Bureau of Labor Statistics, the nonfatal illness and injury rate for the crop production industry (North American Industry Classification System 111) was 5.5 per 100,000 full-time equivalent U.S. workers in

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2013, compared with the U.S. national average of 3.5 for all industries and 2.8 for the wet-corn milling industry (NAICS 311221). The industry experienced 224 total fatalities in 2012, the highest number per 100,000 full-time equivalent U.S. workers. Tractor overturns are the leading cause of death for farmworkers.

Apart from acute impacts, fieldworkers, farmers, and agricultural product plant workers may be exposed to harmful agricultural pesticides, which can have chronic health impacts. A study of acute pesticide exposure cases in the U.S. between 1998 and 2005 found that the majority (87 percent) experienced health impacts of low severity, 12 percent of medium severity, and 0.6 percent of high severity. Exposure to pesticides occurs through spills or splashes, inadequate protective equipment, direct sprays, breathing in pesticide “drift,” eating with pesticide-contaminated hands, eating contaminated fruits and vegetables, or eating in a pesticide-contaminated field.

Respiratory risks to agricultural workers are presented not only by endotoxins and chemical toxicants but also by organic and inorganic dusts. Harvesting, drying, handling, storage, and processing of various grains produce dust. Grain dust can lead to respiratory difficulties, and is an explosion risk. Under its 1987 Grain Handling Facilities Standard, OSHA regulates companies that process agricultural products that create dust. Agricultural facilities must control fugitive grain dust, defined as combustible dust particles of a certain size. In 2008, an explosion at a sugar refinery in Georgia that killed 14 people and injured 36 led OSHA to propose an $8.7 million fine, which was the third largest in the agency’s history.

Companies that fail to provide adequate protection to their workers and to reduce the risk of accidents may face regulatory penalties. Typically, regulatory fines are assessed following health and safety violations that result in an injury. For example, OSHA fined CHS $211,000 in April 2014 for repeatedly failing to reduce worker exposure to grain dust in the workplace. In April 2015, negligence at one of the Cargill’s operations in the U.K. led to the death of a truck driver who was buried in eight metric tons of animal feed. The company was fined £600,000. In 2013, Bunge Canada was fined CAD$115,000 for violation of the Occupational Health and Safety Act that led to the serious injury of one of its workers.

While individual cases may not result in significant penalties, chronic violation of worker safety procedures may have a significant impact on a company’s financial performance through increased premiums for workers’ compensation insurance, wage replacement, labor strikes, work stoppages, and/or decreased employee morale. According to the industry group Agricultural Safety and Health Council of America, occupational injuries in agriculture result in $8.3 billion each year in medical costs and lost productivity. In addition, companies that pay a living wage and protect workers’ rights to collective bargaining and freedom of association may experience lower turnover and higher productivity. Furthermore, poor enforcement of labor standards regarding the employment of children and migrant workers presents an additional reputational and regulatory risk. Agriculture is by far the largest global employer of child laborers, as defined by the International Labour Organization’s Convention No. 138 on Minimum Age (1973) and Convention No. 182 on Worst Forms of Child Labour (1999). Approximately 98 million children ages 5 to 17 are employed in crop and livestock production, or
59 percent of the total number of child laborers.236

As companies are increasingly being held accountable for labor issues in their global supply chains, they are demanding more products made without the use of child labor or slave laborers. In 2012, Whole Foods Market suspended sales of Hershey’s artisan chocolate after activists accused Hershey’s of ignoring child labor abuses by its suppliers.237 In 2014, a U.S. appeals court ruled that ADM and two other companies could be held accountable for allegedly allowing child labor in their cocoa supply chains.238

In the U.S., lax agricultural labor standards and enforcement are ongoing issues. Under the U.S. Fair Labor Standards Act (FLSA), agricultural workers are not entitled to overtime pay if they work more than 40 hours in one week; they also may not be entitled to the FLSA minimum wage if they are local hand-harvest employees, they are working for their families, or their employer uses less than “500 man days” of labor in a year (where a “man day” is defined as a day in which a worker worked for at least one hour).239 Hired farmworkers, who make up approximately one-third of those working on farms, have historically faced high unemployment rates, given the seasonal nature of agriculture as well as their often-limited English-language skills and low levels of education. In 2010, the unemployment rate for U.S. hired farmers was 13.5 percent, compared to an 8.1 percent national average for all jobs.240 The median income from farmwork that year was between $2,500 and $5,000, and 61 percent of the farmworker population lived below the federal poverty line.241

Under the FLSA, children of any age may work on a farm owned or operated by their parents; children ages 12 and up may be employed at the same farm as their parents or at any outside farms with their parents’ consent, and children ages 14 and up may work outside school hours without their parents’ consent.242 In other industries, children must usually be 16 years old to work.243 A 2010 Human Rights Watch report found that as many as 400,000 children work on commercial farms in the U.S., some routinely working for more than 10 hours per day and often for wages well below the federal minimum.244

The FLSA does not provide the same wage and workday requirements for children in agricultural occupations as it does for children in other occupations. Several attempts to update agricultural labor standards have been made in recent years, but none have become law. In 2011, the U.S. Labor Department proposed updated labor regulations for children employed in agricultural and related occupations. The proposal aimed to strengthen outdated standards for youths employed in pesticide handling, grain storage and transportation tasks, and the operation of power-driven equipment.245 Per U.S. labor laws, child workers under the age of 16 are allowed to handle all but the most dangerous pesticides, and the EPA’s rules governing when employees can return to fields after pesticide application do not take into account that children are likely to be more susceptible to the chemicals’ effects.246 In February 2014, the EPA announced proposed changes to its worker protection standards, which govern pesticide exposure in agricultural occupations. The proposed changes include provisions focusing on vulnerable groups, such as minority populations and child workers.247

Moreover, several companies in the Agricultural Products industry have been criticized for not allowing their workers to unionize. For example, Dole, Del Monte, and Chiquita Brands appeared in various issues of the “Working for Scrooge” reports by the International Labor Rights Forum as being the worst companies related to the right to
associate. One of the subsidiaries of Chiquita Brands was accused of using violence to undermine union membership and failing to provide a minimum wage, safe work conditions, and access to social security. Dole was accused of paying to intimidate its workers in Colombia, while its subsidiary in the Philippines allegedly was systematically violating workers' rights to organize.248

In the U.S., according to the Human Rights Watch report, undocumented migrant workers may be at an elevated risk for health and safety abuses in the workplace because they may be disinclined to report incidents for fear of retaliation by their employers. A shareholder resolution filed in 2014 with ADM specifically addressed the health and safety of migrant workers in the company's direct operations and supply chain. The resolution was withdrawn after the company agreed to address the issues raised.249

Companies in the industry have implemented internal labor standards for their international operations, where laws protecting child labor can often be weak or poorly enforced. Chiquita Brands reports in its FY2013 Form 10-K, “[a]ll owned banana farms in Latin America have achieved certification to the Social Accountability 8000 labor standard, which is based on the core International Labor Organization conventions. We were the first major agricultural operator to earn this certification in each of the Latin American countries where we have owned farms.”250 The Social Accountability 8000 labor standard is an auditable certification standard that covers human rights and socially acceptable practices in the workplace. On the positive side, the standard can help businesses implement and receive recognition for using best practices in ethical employment; on the negative side, it can be used as a cover by businesses seeking to avoid further scrutiny from activists.251

Value Impact

Violations of health, safety, and labor standards could result in monetary penalties and costs for corrective actions. High injury rates, particularly fatality rates, may lead to significant reputational harm and indicate weak governance structures and safety culture. Further, a near-miss rate can be a useful tool for management to stem potential problems before they become punctuated and potentially high-magnitude events.

While the certification of farms to fair labor practices may lead to a direct increase in the cost of goods sold, such practices may open additional markets, meet customer demands, and benefit worker productivity, leading to increased revenue. Implementation of fair labor practices can help build brand image while promoting worker moral, which can increase productivity, reduce worker turnover, and enhance community relations.

The industry’s use of migrant and child labor could lead to more stringent government regulation that may impact the cost or availability of labor. Therefore, the probability and magnitude of aforementioned impacts are likely to increase in the future.

BUSINESS MODEL AND 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 innovations in the production process. It also includes product innovation and efficiency and responsibility in the design, use-phase, and disposal of products. It includes 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 Agricultural Products industry plays a crucial role in meeting global food and nutrition demand. Therefore, companies’ adaptability to a changing climate will determine the industry’s success in maintaining productivity sufficient to satisfy societal needs. Climate change is expected to alter global average temperatures and precipitation patterns; to lead to increased frequency of severe weather, including droughts, floods, and storms; and to facilitate the spread of plant diseases and pests. The Agricultural Products industry’s value chain originates with crop cultivation, which is in turn heavily influenced by climate. Thus, adaptation to the effects of climate change is a fundamental driver of the long-term sustainable growth of the industry.

Climate Change Impacts on Crop Yields

Anthropogenic climate change can have a significant impact on the Agricultural Products industry, primarily in regard to increased difficulties or, conversely, opportunities with crop cultivation. Global average temperature increases are expected to contribute to changes in precipitation patterns, temperature variation, and the number and range of crop diseases and pests. In higher latitudes, agricultural production may rise as the growing season lengthens and temperatures moderate. However, low latitudes could experience falling yields as drought, flooding, extreme temperatures, and fire become more frequent.

Impacts on crop yields directly affect the quantity of salable agricultural products. Through strategic changes such as alternative planting methods, seed modification, and crop selection—which, in some cases, may require long lead times to be successfully implemented—companies in the Agricultural Products industry can mitigate the long-term negative effects of climate change on crop yields while maximizing the opportunities for increased yields.

The adaptation potential for the industry is dependent on a variety of factors. Companies can better manage climate change’s effects through proactively addressing its potential impacts, including by implementing adaptive farming strategies. By increasing research and development spending toward breeding more-adaptive crops, agricultural products companies may be able to ensure higher yields in the long term.

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

- Amount of crop losses, percentage offset through financial mechanisms;
- Average crop yield and five-year standard deviation per major crop type by major operating region; and
- Identification of principal crops and discussion of risks and opportunities presented by climate change.

Evidence

As discussed in the earlier issues, companies in this industry are facing various challenges related to the environmental externalities of agricultural processes. While a growing world population will continue to create demand for agricultural products, soil deterioration and changing climate patterns can affect yields, with the potential for significant impact on the results of operations of agricultural companies. For example, annual rice-
yield growth is currently just about one-third of what it was during the “green revolution”, while demand for rice is rising by 2 percent annually in Asia and by 20 percent in Africa. Continued increases in yield are important to meet the growing demand for agricultural products.

Climate change is a major variable in agricultural productivity. The effects of climate change have the potential to both positively and negatively affect crop yield, largely depending on crop type and region. Companies that are maintaining or increasing crop yield may successfully mitigate the effects of climate change. At the same time, companies with decreasing yields may be more exposed to the effects of climate change.

Reduced average yields as a result of climate change can affect crop prices. Studies published by the Institute of Development Studies, the International Food Policy Research Institute, and the UN Food and Agriculture Organization predict that changes in expected average temperature and precipitation worldwide will be a significant driver of increasing market prices for the staple crops maize, rice, and wheat in the next 20 years. An Oxfam research study examined the possible impacts of the increased frequency of severe weather events, another likely outcome of climate change, on the yields of maize, rice, and wheat in the world’s major exporting regions of these crops. The study found that these events, which include droughts and intense precipitation, will have more serious impacts on crop yields than gradual changes in climatic means (temperature and precipitation). Crops can be damaged at specific developmental stages, and severe weather events can physically disrupt farming procedures, lowering efficiency and productivity. For example, the severe heat wave in the U.S. in 2012 led to higher prices of maize and wheat. Climate change can affect crop yields through several channels, including impacts on water. For example, rice farming is a very water-intensive process and consumes almost one-third of global freshwater. The impacts from climate change on precipitation and water availability present a serious risk to the industry, given the sensitivity of crops, such as rice, to water availability. For different crops in general, climate change factors that decrease yields include increased days without precipitation and the increased intensity of precipitation when it does occur. Less-balanced precipitation can lead to drought conditions, while a rise in precipitation intensity can lead to flooding, which may increase erosions and reduce soil nutrient content. This highlights the need for adaptation to changing environmental conditions.

Furthermore, crop responses to rising temperatures vary widely, but it is generally observed that temperatures above a plant’s optimal growing range can reduce yields, especially during the plant’s reproductive phase. By one estimate, a rise in temperature of between 1 and 2 degrees Centigrade could lower average yields by between 10 and 15 percent globally. This is due in part to proliferation of weed and pathogen species in higher latitudes, as well as to decreased soil moisture from the increased presence of perennial herbaceous plants.

Several companies in the Agricultural Products industry have experienced drought-related crop losses that led to significant material impacts. Fresh Del Monte, in discussing its 2014 asset impairments in its FY2014 Form 10-K, included a $1.3 million charge from the effects of the continued drought in Chile on its non-tropical fruit plantations. In 2013, Adecoagro marked down the value of its corn, soybean, and remaining crops by $5.9 million, $16.6 million,
and $2.7 million, respectively, because of drought conditions that decreased yields by 21 to 31 percent versus historical averages.264

Interestingly, rising atmospheric CO₂ levels, a consequence of human activities, may actually enhance crop growth because CO₂ is used by plants during photosynthesis. However, weeds will likewise benefit from this trend, making herbicides less effective.265 Farmers in the U.S. currently spend approximately $11 billion controlling weeds.266

Research by California’s Air Resources Board found that by 2050, average temperatures in the state may rise by as much as 3.6 degrees Fahrenheit, while the Sierra Nevada snowpack, which supplies much of the state’s water, may decline by as much as 40 percent.267 By some estimates, diminished water availability could lead to productivity losses of up to $1.700 per acre in California, the U.S.’s most productive agricultural region. In California, higher temperatures and water stress are expected to contribute to declining crop yields, increased pests and invasive weeds, and soil erosion and are predicted to lead to revenue losses of as much as $3 billion per year by 2050, the most of any sector, because of reductions in irrigated acres. If action to reduce GHG emissions is taken, losses may fall to $1.5 billion.268 Similarly, a 2014 Stanford University study found that an expected warming of 3.5 degrees Fahrenheit in Europe could reduce wheat and barley yields by more than 20 percent, while maize yields may fall by 10 percent.269

Studies indicate that farms must adapt to climate change via the adoption of new crop management technologies and strategies.270 Agricultural products companies can adapt to the effects of climate change by implementing alternative cultivation methods, including switching varieties of crops and growing crops suitable to the local environment.271

Adaptation may require research and development of innovative technologies or varieties of crops. Rice provides 544 kilocalories of energy per capita, more than any other food source in the world.272 The mission of the International Rice Research Institute (IRRI) is to reduce poverty and hunger through rice science.273 In recent years, IRRI developed drought-tolerant varieties of rice that can be planted in dry fields and can subsist on rainfall, much like corn and wheat. Salt-tolerant varieties of rice were created for countries like Bangladesh, where rising sea levels bring saltwater into rice fields; saltwater may poison rice before farmers are able to detect it. None of these varieties is actually genetically modified. A flood-tolerant rice created by IRRI helped farmers in 128 villages in the Indian state of Odisha increase their yields by more than 25 percent.274

Major companies currently disclose varied risks related to climate change in their financial statements. For example, in Bunge’s FY2013 Form 10-K, the company discussed risks related to climate change including “changes in rainfall patterns, water shortages, changing sea levels, changing storm patterns and intensities, and changing temperature levels that could adversely impact [its] costs and business operations, the location and costs of global agricultural commodity production, and the supply and demand for agricultural commodities.” Bunge concluded, “[t]hese effects could be material to our results of operations, liquidity, or capital resources.”275

Agricultural products companies invest in research and development to improve their products, making them more climate-resistant. For example, Wilmar International performs genetic crosses to
breed drought-resistant palm, which can produce a higher oil yield and content, while reducing plant stature. The palm is being developed for the dry African climate. In its 2014 CDP report, Bunge stated that utilizing improved and drought-tolerant sugarcane varieties and enhancing irrigation and other agronomic practices help the company to mitigate adverse weather conditions and to ensure the long-term supply of sugarcane for its industrial operations.

Shareholder resolutions filed with major food products companies indicate investor interest in the effects of climate change on agricultural production. In 2011, Calvert Asset Management filed a resolution with the J.M. Smucker Company requesting that the company detail how it will respond to risks and opportunities presented by climate change to coffee cultivation in the company’s supply chain. Nearly one-third of its shareholders voted in favor of the resolution.

**Value Impact**

Climate change may significantly disrupt the cultivation of crops worldwide through a variety of physical impacts. It will likely increase the risk of crop failure and lower yields. This directly lowers revenues of primary crop producers and raises the price of sourced crops. The amount of crop losses provides insight into both the progressive and the punctuated effects of events related to climate change. A company’s crop yield per hectare directly affects the bottom line: as crop yield per hectare increases, so, too, does the potential for generating revenue, an increase in yield can reduce expenses through gained efficiencies.

The increased risk of crop failure may also lead to a rise in crop insurance costs. Adapting to climate change could require R&D expenditures to advance new methods of cultivation or to grow new crop varieties. These costs could reduce operating income in the near term, but they could also strengthen a company’s growth potential.

Agricultural producers able to successfully adapt to climate change challenges are likely to ensure competitive advantage and strengthen their risk profile, which can have a positive long-term impact on the cost of capital. The probability and magnitude of climate change impacts are likely to increase, particularly in the absence of successful GHG mitigation.

**LEADERSHIP AND 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 are in potential conflict with the interests of broader stakeholder groups (government, community, customers, and employees). They therefore create a potential liability, or worse, a limitation or removal of the license to operate. This includes regulatory compliance, lobbying, and political contributions. It also includes risk management, safety management, supply chain and resource management, conflict of interest, anti-competitive behavior, and corruption and bribery.

Governance risks can impact agricultural products companies through a variety of channels, including through the supply chain and management of the regulatory environment. Many companies in the industry source a portion of their raw crop inputs from farmers and other companies. The largest industry players have extensive global supply chains with thousands of individual suppliers. The sustainability challenges addressed elsewhere in this brief can affect the prices and availability of sourced crops, creating financial risk for firms in the form of higher
operating costs, and can also adversely affect brand reputation.

Special interest groups and corporations advocate on behalf of the industry regarding regulatory policy. Sustainable management of regulatory and political influence includes consideration of the long-term social and environmental externalities that can result from this influence.

Environmental & Social Impacts of Ingredient Supply Chains

Agricultural products companies source a portion of their inputs from farmers or other corporations globally. Managing sustainability risks, including environmental and social issues, within supply chain farms and companies is critical to securing raw materials and to reducing the risk of price increases. For agricultural companies that are not vertically integrated, many of the issues discussed above may be relevant as a result of impacts on their suppliers.

Specific factors that can affect the supply of raw materials include reduced crop yields due to climate change, increasing water scarcity, land management, labor conditions, and the environmental impacts of cultivation. Lower crop yields or higher costs related to sustainability factors among suppliers could directly increase purchase costs, while a purchaser’s association with suppliers that perform poorly on environmental or social issues could result in reputational damage. A damaged reputation is likely to affect demand from food and beverage companies, whose customers are increasingly concerned with the environmental and social footprint of products. Companies recognize these risks and engage with key suppliers to implement sustainable agricultural practices.

Corporate disclosure regarding key supply chain risks and opportunities will enable investors to better identify risk exposure and to effectively measure the efficacy of a company’s efforts to strengthen its supply chain and to sustain long-term value for shareholders.

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

- Percentage of agricultural raw materials sourced from regions with High or Extremely High Baseline Water Stress;
- Description of management strategy for environmental and social risks arising from contract growing and commodity sourcing; and
- Percentage of agricultural raw materials that are certified to a third-party environmental and/or social standard.

Evidence

Some companies source a significant portion of their raw materials from suppliers, including farmers and distributors. The primary channels of financial impact from the supply chain are the price and availability of crop inputs. For example, according to Bunge’s FY2014 Form 10-K, the company purchased a third of its sugarcane from third-party suppliers.279

Companies purchase a wide variety of crops for resale or as raw materials to produce vegetable oils, milled grains, ethanol, and other commodities. Crop yield is the main factor affecting the supply of these materials. Some key inputs to the industry are grown in concentrated regions: wheat in North America and South America, maize in North America, and rice in Asia. This concentration can amplify the effects of lower yields on prices.280
As mentioned in the Climate Change Impacts issue above, lower yields are likely to result in higher crop prices. As the frequency of severe weather event increases, farmers are likely to experience additional difficulties in cultivation procedures and bare-crop losses. Therefore, companies in the industry that work closely with suppliers on increasing their climate change adaptability will be better protected from volatility in crop prices and from disruptions in crop supplies. An analysis of the SEC reports of the largest players in the industry shows that most companies disclose that extreme weather events as a result of climate change may impact—and in some cases have impacted—their performance, either directly or through their supply chain.

The industry’s crop sourcing is a key sustainability issue raised in corporate responsibility reports. This is due in large part to the fact that agricultural products are mostly grown in emerging markets, where environmental and social regulations may not be as stringent. Poor performance on environmental and social factors among suppliers of these products can result in reputational damage. The noteworthy externalities associated with the production of some crops, including palm oil, cocoa, cotton, and bananas, have garnered public attention. For example, ADM reports that key factors examined in the palm oil supply chain include “biodiversity and the environment, by refraining from expanding cropland into sensitive animal habitats and high-conservation-value forest land, and human rights, by maintaining labor standards that prohibit worker exploitation and discrimination, and by helping to ensure that the land used for oil palm does not diminish tribes’ legal or customary rights without their free, prior, and informed consent.”

Indonesia is one of the world’s largest suppliers of palm oil. The country has lost 46 percent of its forests since 1950, fueled by palm oil production. In 2011, Indonesia imposed a moratorium on the issuance of new permits for land development in protected primary forest and on peatlands. The moratorium did not have a negative effect on the growth of Indonesian palm oil production, and at the same time, it reduced the share of palm oil that was sourced unsustainably.

In 2011, Wilmar International was criticized for the alleged destruction of the environment and for human rights violation in Indonesia. Cargill, which has 25 percent of the global palm oil market, sources 95 percent of its third-party crude palm oil in Indonesia from members of the Roundtable on Sustainable Palm Oil (RSPO). RSPO members, which are committed to not clearing land via burning, are often criticized by the Rainforest Action Network (RAN) for a lack of carbon or climate standards as well as “problems with the implementation of social safeguards.” To improve the palm oil industry in Indonesia, RAN focused its campaign on Cargill, which in 2014 committed to adopt a global palm oil policy that addresses widely recognized gaps in the RSPO standards and improves the transparency and traceability of its supply chain. Cargill agreed to monitor its suppliers for compliance with ceasing deforestation, exploitation of indigenous peoples, and other egregious practices.

A 2014 shareholder resolution filed with ADM addressed the need for strong supply chain management in the face of environmental and social risks, highlighting investors’ concern with the issues. The resolution was withdrawn after ADM agreed to address the issues. Moreover, the company states on its website that it will terminate any contract with a supplier that violates U.S. national labor laws. In another example, Bunge, as part of its Global Labor Policy in Brazil, stated, “[w]e cross-reference our agricultural suppliers against the Brazilian...
government’s list of farms that have been found to commit labor abuses and violate environmental laws to ensure that farms with serious labor or environmental infractions are excluded from our agricultural supply chain.”

For those companies with extensive global supply chains, active management of sustainability concerns is needed to reduce reputational damage and ingredient supply impacts. In 2010, one of Cargill’s and Bunge’s suppliers, Guarani farm, was found by the Brazilian Ministry of Labor and Employment to be in violation of fair labor practices. Reportedly, Guarani’s workers were not receiving regular wages and were forced to work 14-hour days without time off on weekends. Moreover, workers were not provided with adequate housing, access to drinking water, hygiene facilities, or legally required protective equipment.

During the 2014 FIFA World Cup, Coca Cola was criticized for sourcing its sugar from Bunge, which, in turn, buys it from the land that was allegedly stolen from Guarani people of Brazil. The land grab resulted in a dramatic increase in suicides among the Brazilian Guarani, who have the highest suicide rate in the world. While in some cases, companies in the Agricultural Products industry are primarily involved in business-to-business transactions and their reputations may not be directly impacted by end consumers’ perceptions, they may still be significantly affected through the loss of clients. As many agricultural companies’ clients operate in food and beverage industries that are themselves end-consumer-facing, they have a high degree of concern for their reputation and brand value. When poor performance on environmental and social issues is found within their supply chains, food and beverage companies may discontinue sourcing from specific agricultural companies.

In additional evidence of food and beverage companies focusing on the sustainability of their supply chains, in 2013, General Mills announced a commitment to sustainably source 10 key ingredients, which make up 50 percent of its raw material purchases, by 2020.

**Value Impact**

Agricultural products companies rely on stable supplies of agricultural inputs. Climate change and environmental degradation could increase the probability of crop failure or lower yields, and in turn raise purchase costs. In addition, issues such as labor abuses can similarly raise purchase costs if supplies are constrained or truncated because of labor issues. Supply chain interruption can cause a loss of revenue and market share if companies are not able to find alternatives to key suppliers, and can raise purchasing costs if supplies are found elsewhere at a higher cost. Recurring supply chain disruptions can create operational risks, and the resulting financial consequences may harm a company’s credit profile over time, impacting its cost of capital.

Having to source a greater amount of products from water-stressed regions may indicate higher input costs, increased competition for quality resources, and/or disruptions to the supply chain. Sourcing from certified suppliers gives agricultural companies assurance that the inputs to its products have been developed in accordance with a high standard for social and environmental principles, reducing the risk that a company will face a loss in brand image due to its sourcing practices.

Evolving regulations focused on addressing environmental externalities are likely to become more stringent, increasing the probability and magnitude of the aforementioned impacts in the future.
Management of the Legal & Regulatory Environment

The interaction of companies with the regulatory environment includes political contributions and lobbying, which can be directed towards issues with sustainability implications, such as crop insurance subsidies and the RFS program in the case of the Agricultural Products industry. Corporate lobbying is particularly relevant for U.S. markets, where financial contributions and lobbying by registered lobbyists are legally recognized ways of engaging with policymakers. While commonly used by a number of companies and industry associations across different industries, political lobbying and contributions have been criticized for unduly influencing government policy, thereby creating negative social and environmental externalities or policy outcomes that may not align with society’s best interests in the long term.

In the Agricultural Products industry, corporate lobbying is often directed towards crop-insurance-subsidy policy and the RFS program that is likely to support demand for certain crops. These actions can benefit the industry by lowering risks and improving profitability in the short term. Nonetheless, the potential for long-term adverse environmental impacts from some of these policies or the ways they are designed may ultimately create policy reversals or unfavorable changes; these could include, for example, lowering of government subsidies or conditionalities introduced for obtaining subsidies.

In some instances, government subsidies support overproduction, which may lead to environmental degradation through expanded acreage into marginal lands or more harmful intensive farming practices. Crop insurance mitigates weather and environment-related risk, which could increase significantly in the future because of climate change. However, this is an area where despite short-term gains, lobbying could create adverse sustainability impacts in the long term—subsidies for crop insurance, without appropriate measures to incorporate long-term sustainability considerations, may reduce incentives to practice farming techniques such as conservation tillage, cover-cropping, and more efficient irrigation. This could ultimately impact company results by impacting crop yields. Support of policies that affect or delay corporate action on both climate mitigation and adaptation as well as ecological impacts could be detrimental to shareholder value in the long term.

In addition to lobbying in support of crop insurance subsidies, a heavy reliance on the biofuel industry—one of the main purchasers of corn and soybean crops—prompts agricultural companies to lobby for support of the U.S. EPA’s RFS program, which creates demand for biofuels based on such crops. While fuel-cycle GHG emissions of biofuels may be lower than those from fossil fuels, there are negative externalities related to agricultural feedstock production for biofuels—such as ecological impacts from the use of fertilizers and pesticides in intensive agriculture and water consumption for crop irrigation discussed earlier in this brief, as well as possible influences on food prices. Such externalities are prompting proposals for a shift in regulatory support from crop-based biofuels to advanced concerns. Bribery and corruption to influence policies may also be concerns in U.S. markets, but such instances may be less prevalent in countries such as the U.S. with strong enforcement of related laws. For U.S.-listed companies in the Agricultural Products industry, the disclosure topic of bribery and corruption was not found to be likely to constitute material information.

\[\text{VIII} \] In other countries, where there may be more legal restrictions on, or less formal recognition of, interactions of corporate interests and government officials or lawmakers, weaker institutional environments for enforcing related laws, and/or general social acceptance of bribery, influence of government policy through bribery and corruption may be more prominent.
biofuels that use alternative feedstocks and have lower environmental and social externalities.

The Agricultural Products industry therefore faces risks from its reliance on corn and soybean demand created by fuel mandates. As climate change regulations continue to evolve, the demand for ethanol and other food crop-based biofuels may decrease if government support for such biofuels is reduced or withdrawn, putting a substantial share of agricultural companies’ revenue at risk.

Agricultural products companies could benefit from a clear strategy for engaging policymakers and regulators that is aligned with long-term sustainable business outcomes and that accounts for societal and environmental externalities. Companies putting in place strategies to manage such externalities from their operations in addition to engaging with their regulatory and legislative environment directly, could be better positioned to deal with any policy changes that take into account externalities. By engaging with regulators and by managing sustainability issues relevant for their industry, focused on positive societal outcomes, companies will likely be better prepared for medium- to long-term regulatory adjustments.

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

- Discussion of positions on the regulatory and political environment related to environmental and social factors and description of efforts to manage risks and opportunities presented.

**Evidence**

In 2013, the U.S. Farm Bill was the sixth-most lobbied measure in Congress, with more than 350 organizations spending money to influence the bill. Agricultural product companies were a significant contributor, spending $21.8 million in 2013 and $21.1 million in 2014, as well as investing additional funds into the campaigns of many representatives who crafted the bill. Lobbying was heavily focused on the Federal Crop Insurance Program (FCIP), which is replacing direct payments to farmers as a primary vehicle for agricultural subsidies. The direct payments system has been criticized for being provided to farmers without regard to their needs. While the FCIP is arguably a less transparent and more costly system, it is nevertheless rapidly gaining popularity.

As discussed earlier, crop insurance subsidies is an area where short-term gains obtained through lobbying could be overturned due to adverse sustainability outcomes in the long term, ultimately impacting company results. The FCIP insures U.S. farmers against weather-related crop failure. The program paid out a record $17.3 billion in insurance proceeds in 2012 after drought triggered widespread crop failure across the U.S.

The amount of subsidies provided through the FCIP has increased in the past decade. In 2001, the USDA subsidized approximately 30 percent of crop insurance, or $2 billion. In 2011, the agency paid $7.4 billion in subsidies, or nearly 62 percent of total insurance premiums. In 2012, taxpayers covered 60 percent of the crop insurance premiums and absorbed 75 percent of the insurance payouts. The subsidies are technically unlimited, and the USDA is not required to disclose who the recipients are. The level of
insurance chosen by the producer is positively correlated with USDA subsidies.\(^\text{302}\)

Government subsidies, which covered 60 percent of $14 billion of the farmers’ crop insurance premium costs in 2014, may reduce the incentives for farmers to protect themselves from climate change and extreme weather events.\(^\text{303}\) It has been argued that the FCIP program may reduce incentives to practice farming techniques such as conservation tillage, cover-cropping, and more efficient irrigation.\(^\text{304}\)

Research indicates that crop insurance can also contribute to environmental degradation by encouraging planting in marginal and/or drought-stricken lands. According to a 2014 report by Ceres, a nonprofit organization of investors, companies, and public interest groups advocating for sustainable business practices, the FCIP “sets premium formulas that encourage riskier decisions such as expanding production onto marginal land and planting maize on the same plot year after year.”\(^\text{305}\) According to researchers at the Environmental Working Group, from 2008 to 2011, crop insurance and high agricultural commodity prices contributed to the conversion of 23 million acres of grassland, shrubland, and wetlands to farmland in the U.S. Midwest.\(^\text{306}\)

Lobbying for insurance that limits or does not provide incentives to mitigate climate or ecological impacts can benefit producer income in the short term, but it can negatively affect long-term productivity by advancing unsustainable agricultural practices.

Another regulatory area of focus for the industry is government incentives for biofuels. Corn and soybeans are the two largest crops in the U.S.\(^\text{307}\) Demand for corn for ethanol production, created in large part by the RFS program and other regulatory support for biofuels, has pushed up the price of corn and incentivized an increase in corn acreage.\(^\text{308}\) As of 2013, approximately 43 percent of the corn grown in the U.S. was used for ethanol and dried distillers grains, a coproduct of ethanol production used to feed livestock and poultry.\(^\text{309}\) In 2013, 13 percent of the oil from the soybean crop was used for ethanol, and 24 percent of the oil from crushed soybeans was used for ethanol.\(^\text{310}\) These percentages have grown over time; in 1980, only 0.3 percent of U.S. corn was used for fuel ethanol.\(^\text{311}\) With 2015 corn segment revenues expected to be at $47.5 billion and soybean segment revenues at $32.5 billion, a significant share of agricultural companies’ sales depend on the demand for biofuels.\(^\text{312}\)

Agricultural products companies such as ADM, Cargill, and POET Ethanol Products have joined together to lobby for corn ethanol. Although the largest subsidy, the $6 billion annual volumetric ethanol excise tax credit expired in 2011, mandates for biofuels have existed since 2005 under the RFS.\(^\text{313}\) There is some disclosure among agricultural products companies of their lobbying efforts. Bunge reports that it “supports market based approaches to promoting economically and environmentally efficient first generation biofuels” such as corn and soybeans.\(^\text{314}\) ADM reports that, among other policies, it lobbies to maintain the RFS program.\(^\text{315}\) From 2007 to 2013, ADM spent $10.9 million on lobbying, while POET Ethanol Products spent $5.1 million.\(^\text{316}\)

Currently more than 60 countries have biofuel targets or mandates, but calls for a repeal of corn ethanol mandates are growing, as increasing demand for corn inflates food prices, disproportionately affecting the poor.\(^\text{317}\) At the 2011 G20 summit in Paris, a joint recommendation by the UN Food and Agriculture Organization, International Monetary Fund, the Organization for Economic Co-operation and Development, the World Trade Organization, and
the World Bank, among other international entities, called for governments to adjust biofuels mandates when food markets are pressured.\textsuperscript{318}

The environmental externalities that can be created by government subsidies and policy support for corn- and other food crop-based biofuels are other reasons why there is increasing pressure for the RFS program to shift support from traditional biofuels to advanced biofuels that might have lower externalities.\textsuperscript{319} As with crop insurance subsidies, subsidies and other policy support for traditional biofuels also have the potential to distort incentives and lead to the expansion of crop production in areas with poor soil and water scarcity.\textsuperscript{320} The potential for environmental degradation caused by expanding acreage of corn for ethanol is currently not fully taken into account in programs such as the RFS. Were such concerns accounted for, biofuels produced from corn grown with environmentally sustainable practices may become favored.

By and large, renewable fuel policies reflect concerns about food-crop-based biofuels production by progressively increasing the volume of biofuels from non-food crop sources blended with transport fuels. Some governments have even moved to cap the production volume of crop-based ethanol.\textsuperscript{321} In June 2014, the E.U. agreed on a plan to limit the use of food-based biofuels for transportation to seven percent of total volume, down from the original target of 10 percent. The decision came after a failed 2013 attempt to implement a five percent cap on fuels produced by food crops including corn and rapeseed. Research that found the production of fuel from food crops contributed to the displacement of other food crops, food price inflation, and destruction of natural habitats drove the E.U. to impose the limit.

Changes to biofuels policies that limit, reduce, or remove support of corn ethanol could have acute or progressive impacts on the demand for corn production and corn prices, depending on the nature of the policy change. In its FY2014 Form 10-K, ADM acknowledged, “[g]overnmental policies affecting the agricultural industry … including policies related to … renewable fuels, and low carbon fuel mandates, can influence the planting of certain crops, the location and size of crop production.” The company further indicates that changes in the RFS program may have a significant impact on its financial performance.\textsuperscript{322}

Corn ethanol lobbying interests have been in support of adding corn ethanol to the list of advanced biofuels, which would largely eliminate the need to shift production in the biofuels industry to utilize non-food feedstocks.\textsuperscript{323} Such a shift could introduce long-term sustainability challenges, including food security issues. Policies progressively reducing the amount of food crop-based biofuels or encouraging use of sustainably produced feedstocks might allow agricultural products companies to adjust to policy changes with fewer disruptions. Companies could continue to have the opportunity to generate revenues from the biofuels markets through provision of alternate feedstocks such as woody biomass and crop waste, which could supply cellulosic ethanol without the need for additional cropland.\textsuperscript{324}

The adoption of sustainable agricultural production is likely to be a significant driver of long-term profitability in the industry. Industry efforts to preserve or enhance policies that delay or affect corporate action on sustainability issues may not be aligned with the public’s best interest and could prove detrimental in the long run.
Value Impact
The financial impact of managing the political and regulatory environment manifests itself over the long term, as regulations governing environmental and social externalities of agriculture will likely become more stringent over time. Lobbying, campaign contributions, and other politically influential spending or activities that promote policies creating perverse incentives related to the industry’s social or environmental impacts could erode companies’ social license to operate over the long term. While successful lobbying could result in positive short-term gains, these benefits could subsequently be reversed to reflect the balance of corporate and public interest in these issues, leading to a more burdensome regulatory environment. Lobbying can therefore create regulatory uncertainty, increasing the risk profile of companies and their cost of capital.
This list includes five companies representative of the Agricultural Products industry and its activities. This includes only companies for which the Agricultural Products 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, accessed May 26, 2015.

<table>
<thead>
<tr>
<th>COMPANY NAME (TICKER SYMBOL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archer Daniels Midland Company (ADM)</td>
</tr>
<tr>
<td>Bunge (BG)</td>
</tr>
<tr>
<td>Ingredion (INGR)</td>
</tr>
<tr>
<td>Seaboard (SEB)</td>
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<tr>
<td>Adecoagro S.A. (AGRO)</td>
</tr>
</tbody>
</table>
## APPENDIX IIA
### EVIDENCE FOR SUSTAINABILITY DISCLOSURE TOPICS

<table>
<thead>
<tr>
<th>Sustainability Disclosure Topics</th>
<th>EVIDENCE OF INTEREST</th>
<th>EVIDENCE OF FINANCIAL IMPACT</th>
<th>FORWARD-LOOKING IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HM (1-100)</td>
<td>IWGs</td>
<td>EI</td>
</tr>
<tr>
<td>Greenhouse Gas Emissions</td>
<td>50*</td>
<td>82</td>
<td>7</td>
</tr>
<tr>
<td>Energy &amp; Fleet Fuel Management</td>
<td>33</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Water Withdrawal</td>
<td>88*</td>
<td>96</td>
<td>1</td>
</tr>
<tr>
<td>Land Use &amp; Ecological Impacts</td>
<td>46</td>
<td>93</td>
<td>3</td>
</tr>
<tr>
<td>Food Safety &amp; Health Concerns</td>
<td>71*</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>Fair Labor Practices &amp; Workforce Health &amp; Safety</td>
<td>38</td>
<td>89</td>
<td>6</td>
</tr>
<tr>
<td>Climate Change Impacts on Crop Yields</td>
<td>75*</td>
<td>85</td>
<td>4</td>
</tr>
<tr>
<td>Environmental &amp; Social Impacts of Ingredient Supply Chains</td>
<td>29</td>
<td>85</td>
<td>5</td>
</tr>
<tr>
<td>Management of the Legal &amp; Regulatory Environment</td>
<td>0</td>
<td>89</td>
<td>8</td>
</tr>
</tbody>
</table>

**HM:** Heat Map, a score out of 100 indicating the relative importance of the topic among SASB’s initial list of 43 generic sustainability issues. Asterisks indicate “top issues.” The score is based on the frequency of relevant keywords in documents (i.e., 10-Ks, 20-Fs, shareholder resolutions, legal news, news articles, and corporate sustainability reports) that are available on the Bloomberg terminal for the industry’s publicly listed companies. Issues for which keyword frequency is in the top quartile are “top issues.”

**IWGs:** SASB Industry Working Groups.

**%:** The percentage of IWG participants who found the disclosure topic likely to constitute material information for companies in the industry. (-) denotes that the issue was added after the IWG was convened.

**Priority:** Average ranking of the issue in terms of importance. 1 denotes the most important issue. (-) 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 SUSTAINABILITY DISCLOSURE TOPICS

<table>
<thead>
<tr>
<th>Evidence of Financial Impact</th>
<th>REVENUE &amp; EXPENSES</th>
<th>ASSETS &amp; LIABILITIES</th>
<th>RISK PROFILE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Revenue</td>
<td>Operating Expenses</td>
<td>Non-operating Expenses</td>
</tr>
<tr>
<td></td>
<td>Market Share</td>
<td>New Markets</td>
<td>Pricing Power</td>
</tr>
<tr>
<td>Greenhouse Gas Emissions</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Energy &amp; Fleet Fuel Management</td>
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<td></td>
<td></td>
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<tr>
<td>Water Withdrawal</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Land Use &amp; Ecological Impacts</td>
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<tr>
<td>Food Safety &amp; Health Concerns</td>
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<tr>
<td>Fair Labor Practices &amp; Workforce Health &amp; Safety</td>
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<td></td>
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<tr>
<td>Climate Change Impacts on Crop Yields</td>
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<td></td>
<td></td>
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<tr>
<td>Environmental &amp; Social Impacts of Ingredient Supply Chains</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Management of the Legal &amp; Regulatory Environment</td>
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<td></td>
</tr>
</tbody>
</table>

- MEDIUM IMPACT
- HIGH IMPACT

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**INDUSTRY BRIEF | AGRICULTURAL PRODUCTS | 53**
# APPENDIX III
## SUSTAINABILITY ACCOUNTING METRICS | AGRICULTURAL PRODUCTS

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>ACCOUNTING METRIC</th>
<th>CATEGORY</th>
<th>UNIT OF MEASURE</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Greenhouse Gas Emissions</strong></td>
<td><strong>Gross global Scope 1 emissions</strong></td>
<td>Quantitative</td>
<td>Metric tons (t)</td>
<td>CN0101-01</td>
</tr>
<tr>
<td></td>
<td><strong>Biogenic carbon dioxide (CO$_2$) emissions</strong></td>
<td>Quantitative</td>
<td>Metric tons (t) CO$_2$-e</td>
<td>CN0101-02</td>
</tr>
<tr>
<td></td>
<td><strong>Description of long-term and short-term strategy or plan to manage Scope 1 emissions, emission-reduction targets, and an analysis of performance against those targets</strong></td>
<td>Discussion &amp; Analysis</td>
<td>n/a</td>
<td>CN0101-03</td>
</tr>
<tr>
<td><strong>Energy &amp; Fleet Fuel Management</strong></td>
<td><strong>Operational energy consumed, percentage grid electricity, percentage renewable</strong></td>
<td>Quantitative</td>
<td>Gigajoules (GJ), Percentage (%)</td>
<td>CN0101-04</td>
</tr>
<tr>
<td></td>
<td><strong>Fleet fuel consumed, percentage renewable</strong></td>
<td>Quantitative</td>
<td>Gigajoules (GJ), Percentage (%)</td>
<td>CN0101-05</td>
</tr>
<tr>
<td><strong>Water Withdrawal</strong></td>
<td><strong>(1) Total water withdrawn and (2) total water consumed, percentage of each in regions with High or Extremely High Baseline Water Stress</strong></td>
<td>Quantitative</td>
<td>Cubic meters (m$^3$), Percentage (%)</td>
<td>CN0101-06</td>
</tr>
<tr>
<td></td>
<td><strong>Discussion of water withdrawal risks and description of management strategies and practices to mitigate those risks</strong></td>
<td>Discussion &amp; Analysis</td>
<td>n/a</td>
<td>CN0101-07</td>
</tr>
<tr>
<td><strong>Land Use &amp; Ecological Impacts</strong></td>
<td><strong>Description of strategies to manage land use and ecological impacts</strong></td>
<td>Discussion &amp; Analysis</td>
<td>n/a</td>
<td>CN0101-08</td>
</tr>
<tr>
<td></td>
<td><strong>(1) Volume of wastewater reused and (2) volume of wastewater discharged to the environment</strong></td>
<td>Quantitative</td>
<td>Cubic meters (m$^3$)</td>
<td>CN0101-09</td>
</tr>
<tr>
<td></td>
<td><strong>Number of incidents of non-compliance with water-quality permits, standards, and regulations</strong></td>
<td>Quantitative</td>
<td>Number</td>
<td>CN0101-10</td>
</tr>
<tr>
<td></td>
<td><strong>Amount of fertilizer consumption by: (1) nitrogen-based, (2) phosphate-based, and (3) potassium-based fertilizers</strong></td>
<td>Quantitative</td>
<td>Metric tons (t)</td>
<td>CN0101-11</td>
</tr>
<tr>
<td></td>
<td><strong>Amount of pesticide consumption by hazard level</strong></td>
<td>Quantitative</td>
<td>Metric tons (t)</td>
<td>CN0101-12</td>
</tr>
<tr>
<td><strong>Food Safety &amp; Health Concerns</strong></td>
<td><strong>Global Food Safety Initiative (GFSI) audit conformance: (1) major non-conformance rate and associated corrective action rate and (2) minor non-conformance rate and associated corrective action rate</strong></td>
<td>Quantitative</td>
<td>Rate</td>
<td>CN0101-13</td>
</tr>
<tr>
<td></td>
<td><strong>Percentage of agricultural products sourced from suppliers certified to a Global Food Safety Initiative (GFSI) scheme</strong></td>
<td>Quantitative</td>
<td>Percentage (%) by spend</td>
<td>CN0101-14</td>
</tr>
<tr>
<td></td>
<td><strong>Number of recalls issued, total amount of food product recalled</strong></td>
<td>Quantitative</td>
<td>Number, Metric tons (t)</td>
<td>CN0101-15</td>
</tr>
<tr>
<td></td>
<td><strong>Description of strategies to manage the use of genetically modified organisms (GMOs)</strong></td>
<td>Discussion &amp; Analysis</td>
<td>n/a</td>
<td>CN0101-16</td>
</tr>
</tbody>
</table>

* Note to CN0101-02—Disclosure should include discussion of whether the registrant’s biogenic CO2 emissions are carbon neutral.

** Note to CN0101-09—Disclosure shall include a description of the risk related to wastewater discharge and the wastewater treatment and management method(s) used.

*** Note to CN0101-12—Disclosure shall include a description of any uses of WHO Class Ia and Ib pesticides.

**** Note to CN0101-15—Disclosure shall include a description of notable recalls, such as those that affected a significant amount of product or those related to serious illness or fatality.
<table>
<thead>
<tr>
<th>TOPIC</th>
<th>ACCOUNTING METRIC</th>
<th>CATEGORY</th>
<th>UNIT OF MEASURE</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fair Labor Practices &amp; Workforce Health &amp; Safety</strong></td>
<td>Percentage of farms and facilities certified for fair labor practices</td>
<td>Quantitative</td>
<td>Percentage (%)</td>
<td>CN0101-17</td>
</tr>
<tr>
<td></td>
<td>(1) Total recordable injury rate (TRIR), (2) fatality rate, and (3) near miss frequency rate (NMFMR) for (a) direct employees and (b) seasonal and migrant employees</td>
<td>Quantitative</td>
<td>Rate</td>
<td>CN0101-18</td>
</tr>
<tr>
<td></td>
<td>Description of efforts to assess, monitor, and reduce exposure of direct, seasonal, and migrant employees to pesticides</td>
<td>Discussion &amp; Analysis</td>
<td>n/a</td>
<td>CN0101-19</td>
</tr>
<tr>
<td><strong>Climate Change Impacts on Crop Yields</strong></td>
<td>Amount of crop losses, percentage offset through financial mechanisms</td>
<td>Quantitative</td>
<td>U.S. Dollars ($), Percentage (%)</td>
<td>CN0101-20</td>
</tr>
<tr>
<td></td>
<td>Average crop yield and five-year standard deviation per major crop type by major operating region</td>
<td>Quantitative</td>
<td>Metric tons (t)</td>
<td>CN0101-21</td>
</tr>
<tr>
<td></td>
<td>Identification of principal crops and discussion of risks and opportunities presented by climate change</td>
<td>Discussion &amp; Analysis</td>
<td>n/a</td>
<td>CN0101-22</td>
</tr>
<tr>
<td><strong>Environmental &amp; Social Impacts of Ingredient Supply Chains</strong></td>
<td>Percentage of agricultural raw materials sourced from regions with High or Extremely High Baseline Water Stress</td>
<td>Quantitative</td>
<td>Percentage (%) by spend</td>
<td>CN0101-23</td>
</tr>
<tr>
<td></td>
<td>Description of management strategy for environmental and social risks arising from contract growing and commodity sourcing</td>
<td>Discussion &amp; Analysis</td>
<td>n/a</td>
<td>CN0101-24</td>
</tr>
<tr>
<td></td>
<td>Percentage of agricultural raw materials that are certified to a third-party environmental and/or social standard</td>
<td>Quantitative</td>
<td>Percentage (%) by spend</td>
<td>CN0101-25</td>
</tr>
<tr>
<td><strong>Management of the Legal &amp; Regulatory Environment</strong></td>
<td>Discussion of positions on the regulatory and political environment related to environmental and social factors and description of efforts to manage risks and opportunities presented</td>
<td>Discussion &amp; Analysis</td>
<td>n/a</td>
<td>CN0101-26</td>
</tr>
</tbody>
</table>
**APPENDIX IV: Analysis of SEC Disclosures | Agricultural Products**

The following graph demonstrates an aggregate assessment of how representative U.S.-listed Agricultural Products companies are currently reporting on sustainability topics in their SEC annual filings.

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>NO DISCLOSURE</th>
<th>BOILERPLATE</th>
<th>INDUSTRY-SPECIFIC</th>
<th>METRICS</th>
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</thead>
<tbody>
<tr>
<td>Greenhouse Gas Emissions</td>
<td></td>
<td></td>
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<tr>
<td>Energy &amp; Fleet Fuel Management</td>
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<tr>
<td>Water Withdrawal</td>
<td></td>
<td></td>
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<tr>
<td>Land Use &amp; Ecological Impacts</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Food Safety &amp; Health Concerns</td>
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<tr>
<td>Fair Labor Practices &amp; Workforce Health &amp; Safety</td>
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<td></td>
<td></td>
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<tr>
<td>Climate Change Impacts on Crop Yields</td>
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<td></td>
</tr>
<tr>
<td>Environmental &amp; Social Impacts of Ingredient Supply Chains</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Management of the Legal &amp; Regulatory Environment</td>
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IWG Feedback*: 82% - 96%

*Percentage of IWG participants that agreed topic was likely to constitute material information for companies in the industry. (-) denotes that the issue was added after the IWG was convened.
REFERENCES


5 Data from Bloomberg Professional service, accessed on May 26, 2015, using the BICS <GO> command. The data represent global revenues of companies listed on global exchanges and traded over the counter (OTC) from the Agricultural Products industry, using Level 4 of the Bloomberg Industry Classification System.

6 Author’s calculation based on data from Bloomberg Professional service, accessed on May 26, 2015, using Equity Screen (EQS) for U.S.-listed companies that generate at least 20 percent of revenue from their Agricultural Products segment and for which Agricultural Products is a primary SICS industry.

7 From the SEC filings of companies in the Agricultural Products industry.


12 From the SEC filings of companies in the Agricultural Products industry.


23 Author’s calculation based on data from Bloomberg Professional service, accessed on June 9, 2015, using Equity Screen (EQS) for U.S.-listed companies and those traded primarily OTC that generate at least 20 percent of revenue from their Agricultural Products segment and for which Agricultural Products is a primary SICS industry.


40 Stubbs, “Environmental Regulation and Agriculture.”


50 Martella and Grosko, eds., Central and South America Overview, pp. 365–95.


57 Bloomberg Professional service, accessed on April 14, 2015, using the BICS <GO> command. The data represent global revenues of companies listed on global exchanges and traded over the counter from the Agricultural Products industry, using Level 4 of the Bloomberg Industry Classification System.

58 From an internal analysis of the SEC filings of companies in the Agricultural Products industry.


67 Ibid.


78 Ibid.


82 Metcalf and Reilly, “Policy Options for Controlling Greenhouse Gas Emissions.”


87 Hammerschlag, "California’s Climate Change Policy Leaves Agriculture in the Dust."


90 Author’s calculation based on the data from Bloomberg Professional service, accessed April 14, 2015, using the BICS <GO> command. The data represent global revenues of companies listed on global exchanges and traded over-the-counter from the Agricultural Products industry, using Level 4 of the Bloomberg Industry Classification System.


92 Author’s calculations based on data from the U.S. EPA’s GHG Reporting Program Data Sets from “Summary GHG Data 2013 (as of August 18, 2014) (XLS),” http://www.epa.gov/ghgreporting/ghgdata/reportingdatasets.html.


100 Author’s calculation based on data from “Annual Survey of Manufactures.”


139 Roberts and Barton, “Feeding Ourselves Thirsty.”

140 Ibid.


145 Ibid.


149 Ibid.

150 Ibid., p. 2.


181 Bunge Ltd., FY2013 Form 10-K for the Period Ending December 31, 2013 (filed February 28, 2014), Section 1A, p. 11.


188 Bunge Ltd., FY2013 Form 10-K for the Period Ending December 31, 2013 (filed February 28, 2014), Section 1A, p. 20.


195 Grocery Manufacturers Association et al., *Capturing Recall Costs*.


204 Ingredion Inc., FY2013 Form 10-K for the Period Ending December 31, 2013 (filed February 24, 2014), Section 1A, p. 16.


206 Ibid.


212 Roberts and Barton, “Feeding Ourselves Thirsty.”


224 The farm product raw material merchant wholesalers (NAICS 4245) industry’s nonfatal illness and injury rate was not reported in 2013.


260 Ibid., p. 27.


263 Fresh Del Monte, FY2014 Form 10-K for the Period Ending December 26, 2014 (filed February 18, 2015), p. 32.


Faber, Rundqvist, and Male, “Plowed Under.”


Barton and Clark, “Water and Climate Risks Facing U.S. Maize Production.”

Faber, Rundqvist, and Male, “Plowed Under.”


Neville, Industry Report 11115 Corn Farming in the US, p. 3; McKitterick, Industry Report 11111 Soybean Farming in the US, p. 3.


316 “Updated: Political Footprint of the Corn Ethanol Lobby,” Taxpayers for Common Sense.


324 Wilkenson, “Biofuels and Food Security."