An Investor Brief on Impacts that Drive Business Risks: SOYBEANS

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

**KEY TAKEAWAYS**

- Soybean production has more than doubled worldwide over the past 20 years, expanding into a $123 billion market. As global demand for meat has increased, the use of soybeans in livestock feed has exploded. In human food products, soybeans are used as a cooking oil, a source of protein in meat and dairy substitutes and as an ingredient in many processed food products.

- Deforestation and the loss of native vegetation is the most salient, region-specific issue associated with soybean production. It is a significant driver of greenhouse gas emissions and leads to the loss of biodiversity, which impacts not only the health of the local ecosystem but also the local populations that depend on these natural resources to survive.

- In the Amazon Basin, the Atlantic Forests and the Brazilian Cerrado, carbon dioxide emissions (CO2) from land conversion are significant. Based on the Cerrado alone, this equals about 60 percent of Spain's total emissions in 2015. While the Soy Moratorium in Brazil has reduced impacts on the Amazon, the loss of native vegetation in areas like the Cerrado, that are not covered by the Moratorium, remain a material business risk.

- Investors should address risk in the soybean supply chain through direct engagement with their portfolio companies and by supporting relevant policies and multi-stakeholder collaborations. Effective implementation of a company's policies requires promoting commodity traceability and having a clear approach to supplier engagement, verification and disclosure of progress.

**COMMODITY OVERVIEW**

The Vast Majority of Global Soybean Production is Used to Feed Animals

Globally traded and highly versatile, soybeans are the world’s largest source of animal protein feed and the second largest source of vegetable oil.¹

About **85 percent** of global soybean production is crushed into meal and vegetable oil. The other **15 percent** is sold as whole beans.

Of the soybeans crushed: **80 percent** is used for meal; **20 percent** for vegetable oil.

For the meal: virtually all (**98 percent**) is used to feed animals (e.g., pigs, poultry, cattle and farmed fish); **2 percent** is processed for food use.

For the oil: most (**95 percent**) is for food use—cooking oil and processed food products such as margarines, dressings and mayonnaise—with the remainder (**5 percent**) used for industrial products such as fatty acids, soaps and biodiesel.

Global soybean production, by volume (data from multiple sources²,³,⁴,⁵)

- **15%** Whole Beans
- **17%** Vegetable Oil
- **68%** Meal
- 98% of meal is used to feed animals
GLOBAL PRODUCTION DATA

The U.S., Brazil & Argentina Account for 81 Percent of Global Soybean Production

321 MILLION METRIC TONS
Average global soybean production, 2014-2016

$112 BILLION
Global production value

38 PERCENT
Proportion of global production exported

TOP FIVE PRODUCTION REGIONS

- 29% Brazil
- 18% Argentina
- 4% China
- 3% India
- 12% Other

Rising Meat Consumption and Biofuel Mandates Drive Demand

Global soybean production grew rapidly over the last decade, primarily in response to demand from China and Europe for soy-based animal feed as worldwide appetite for meat soars. The largest jump in soybean production to meet this demand has happened in South America (particularly Brazil), and this expansion has contributed significantly to deforestation and the loss of other high conservation value native vegetation. For example, in the Matopiba region of Brazil's Cerrado, soybean production grew by over 250 percent between 2000 and 2014; 62 percent of this was from the conversion of native vegetation.

In the U.S., multiple factors have boosted soybean production over the last decade. These factors have included government policies supporting agricultural production through protection or subsidies, biofuel mandates, international demand, and periods of high prices for agricultural commodities. Between 2008 and 2012, 5.3 million acres of highly erodible land in the U.S. were converted to grow row crops, an estimated 13 percent to soybeans.
The soybean supply chain is complex and includes many sectors, however a small group of big companies control large volumes of production at key points in the supply chain.
SEED COMPANIES

Bayer, DuPont (Pioneer) and Syngenta (privately owned by ChemChina) are among the largest companies that provide seeds to farmers.

TRADERS AND DISTRIBUTORS

Archer Daniels Midland (ADM), Bunge, Cargill (privately held) and Louis Dreyfus Commodities (headquartered in Europe) control much of this link in the supply chain.

MANUFACTURERS

Animal Feed Processors: The largest U.S. feed producing companies include Cargill, Purina Animal Nutrition (subsidiary of Land O’Lakes), Tyson Foods and Alltech (privately held). Archer Daniels Midland (ADM), Bunge, Cargill (privately held) and Louis Dreyfus Commodities (headquartered in Europe) control much of this link in the supply chain.

Animal Feed Purchasers: Some of the largest U.S. companies that purchase animal feed (likely to contain soybean-derived ingredients) are:

- Poultry Processors: Tyson Foods, Pilgrim’s Pride (a subsidiary of JBS USA; JBS is headquartered in Brazil) and Perdue together account for 45 percent of the U.S. market.
- Pork Processors: Smithfield (the largest by far and privately owned by Shuanghui Group in China), Tyson Foods and JBS USA together control more than half the U.S. market.
- Beef Processors: Tyson Foods, JBS USA, Cargill and National Beef (privately held) collectively account for 75 percent of the U.S. market.

Dairy Processors: Nestle USA, Dean Foods and Land O’Lakes (a cooperative) are among the leading dairy companies.

Egg Producers: Cal-Maine Foods and Rose Acre Farms (privately held) lead the sector in number of hens housed.

Packaged Food Manufacturers: Large U.S. buyers of soybean-derived ingredients include margarine and mayonnaise producers (e.g., Unilever USA) and vegetable oil producers (e.g., Conagra Brands).

RESTAURANTS AND RETAILERS

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

Restaurants are heavy users of both soybean oil, which is used directly in bakery products and as a cooking oil, and soybean meal, which is used indirectly in meat products produced with soybean meal. The four largest limited-service restaurants in the U.S. are McDonald’s, Yum! Brands (Taco Bell, Pizza Hut, KFC), Starbucks and Restaurant Brands International. In terms of food retailers, the four largest in the U.S. are Walmart, Kroger, Albertsons Companies and Ahold Delhaize USA.
Globally, the environmental and social issues linked to soybean production include deforestation and conversion of other high conservation value native vegetation, greenhouse gas emissions, groundwater depletion, water pollution and land rights violations. The scale of the impacts depends on the practices used by individual soybean growers as well as regional and local conditions.

Soybeans are often grown in rotation with other crops (e.g., corn), which means that the impacts and risks may be linked to other commodities, and therefore, cannot be addressed in isolation.

**DIFFERENT REGIONS, DIFFERENT IMPACTS**

Most soybean meal and oil used in the U.S. is grown and processed in the U.S. where conversion of important grasslands and conservation lands to soybean production is one of the biggest issues driving risks. However, many U.S. companies operate globally and may sell products made with soybeans from Brazil or other regions where other issues like deforestation are the primary concern.
1. CONVERSION OF NATURAL HABITAT LEADS TO GREENHOUSE GAS EMISSIONS AND LOSS OF BIODIVERSITY

Destruction of natural vegetation for soybean production generates greenhouse gases that contribute to climate change. It also leads to the loss of biodiversity, which impacts not only the health of the local ecosystem but also the local populations that depend on these natural resources to survive. These impacts are of particular concern in countries that are home to some of the most biodiverse areas on the planet, including Brazil, Argentina and Paraguay. In the U.S., the conversion of millions of acres of important grasslands in the Great Plains to cropland in the last several years, has led to reductions in biodiversity (birds) and the loss of soil carbon. Companies that fail to understand and mitigate impacts related to these issues may face market, reputational, litigation and operational risks (see more at Ceres’ Agricultural Supply Chains as a Driver of Financial Risks).

2. IRRIGATION CAN CONTRIBUTE TO GROUNDWATER DEPLETION

Demand for irrigation water use varies greatly between soybean-producing countries and regions. For example, soybeans are mainly a rainfed crop in South America but are more heavily irrigated in other regions. In areas where soybean production relies on irrigation, unsustainable water use can strain aquifers, such as the Ogallala Aquifer in North America and the Guarani Aquifer in South America. Globally, nearly 20 percent of soybeans are grown in regions of high or extremely high water stress (e.g., U.S. and China), meaning regions where existing water supplies face intense competition and in some cases growing regulation. Companies that fail to understand and manage impacts related to these issues may face operational, reputational and regulatory risks (see more at Ceres' Agricultural Supply Chains as a Driver of Financial Risks).

**SOYBEANS**

**19 PERCENT**
Percentage of Production in Regions of Water Stress

**8 PERCENT**
Percentage of Global Production Irrigated

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**REGIONAL CONTEXT**

The three main ecoregions most affected by soybean production in South America are the Amazon Basin, Atlantic Forests, and the Brazilian Cerrado. Based on the Cerrado alone, carbon dioxide emissions from land conversion are estimated to equal about 60 percent of Spain's total emissions in 2015.

In the Amazon, an area of the world that plays a vital role in regulating the global climate, soybean production has historically been a major driver of deforestation. In the Cerrado grasslands, a global biodiversity hotspot that stores substantial amounts of carbon and is a key source of the water critical for Brazil's agricultural productivity, soybean production has already contributed to conversion of more than half the savannah. Estimates predict the possible destruction of an additional one-third of the Cerrado by 2050 if current conversion rates continue.

While the Soy Moratorium in Brazil and other factors have helped to reduce soybean production in the Amazon, the loss of important native vegetation in the Brazilian Cerrado, which is not covered by the Moratorium, and where 60 percent of soy is grown, is expected to remain a material business risk. Since the current Brazilian law (the Native Vegetation Protection Law) still allows for legal conversion of land in the Cerrado, various efforts are underway to stem the ongoing rapid conversion of this critical ecosystem. This includes collaborative announcements like the Cerrado Manifesto and other efforts to restore degraded lands.

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**It Takes 2,107 LITERS OF WATER To Produce 1 KG SOYBEAN (Weighted Global Average)**
3. COMPETITION FOR LAND CAN LEAD TO EXPLOITATION OF COMMUNITIES AND WORKERS

Soybean production in developing countries, such as Brazil, Argentina and Paraguay, has been associated with negative social impacts, particularly when small-scale farmers and communities have been pushed off their lands to make way for commercial soybean operations. In such instances, land rights of indigenous or local communities may not be documented or recognized, leaving local people at risk of losing their homes and livelihoods when they are evicted or wrongfully displaced from their land. Companies that fail to understand and manage impacts related to land rights may face market and reputational risks such as protests, work stoppages or damaging social campaigns from activist groups.

4. GENETICALLY MODIFIED SEEDS ARE LINKED TO HIGHER HERBICIDE USE AND CONSUMER CONCERNS

Genetically modified soybeans, which are altered to tolerate certain herbicides so that farmers can kill weeds without harming the plant, are grown in may parts of the world. For instance, in the U.S. and Argentina, most of the soybean crops are genetically modified. While widespread adoption of genetically modified crops has decreased the use of insecticides, as weeds have become more resistant, there has been an increased use of weed-killing herbicides. In large doses, these herbicides can harm biodiversity, increase water and air pollution and affect the health of people living near soybean fields. Moreover, a number of civil society organizations that are concerned about human health and environmental impacts are raising awareness about the use of genetically modified organisms (GMOs) and promoting product labeling. Potential reputational risk may develop for companies that cater to consumers and suppliers within their supply chain. A market risk may exist if buyers demand substitution of non-GMO product.
**U.S. SPOTLIGHT**

Soybeans used in the U.S. are typically produced domestically. More than 80 percent of U.S. soybean acreage is concentrated in the upper Midwest, where the crop is frequently rotated with corn. Nutrient pollution and groundwater depletion are significant concerns in this region. Environmental Working Group’s maps of soybean production acreage in ecologically sensitive regions show that between 1980-2011, total soybean production doubled and yield (bushels per planted acre) increased by 55 percent in the U.S. This increase in production has had significant environmental impacts. Even though soybean production in the U.S. has become more efficient, in 2015 compared to 1980 (across five indicators tracked on a “per bushel” basis) total resource use increased in four of those areas because of the significant increase in total production.

- Land use (+31 percent)
- Irrigation water applied (+438 percent)
- Energy use (+42 percent)
- Greenhouse gas emissions (+37 percent)

Only soil erosion decreased by 32 percent, though more recent trends indicate a slight increase.
COLLABORATIVE INITIATIVES

Many players, including buyers, producers, governments, NGOs and communities understand the risks at play and are collaborating to ensure the long-term sustainability of soybean production.

MULTI-STAKEHOLDER SUSTAINABILITY EFFORTS

While a number of multi-stakeholder efforts relate to multiple commodities, those specifically focused on soybean production include the Soybean Sustainability Assurance Protocol (SSAP) in the U.S., and the Soy Moratorium, Cerrado Manifesto and the Soja Plus program in Brazil.

BRAZIL SPOTLIGHT

**BRAZIL SOY MORATORIUM**

In 2006, following the release of a Greenpeace report, consumer activism, and company leadership from McDonald’s, the first voluntary, zero-deforestation agreement in the world was implemented. The “Soy Moratorium” was signed by multinational commodity traders (including ADM, Cargill and Bunge), and set the stage for supply-chain governance initiatives for other commodity drivers of deforestation, such as beef and palm oil. The Moratorium bans the purchase of soybeans grown on land deforested in the Brazilian Amazon after the agreement was signed. This agreement has been extended indefinitely and been critical to drastically reducing the amount of deforestation linked to soybean production in the Amazon from 30 percent prior to the Moratorium to just 1 percent in 2014. A 2015 study found that this private sector agreement was more effective at stemming deforestation than the government’s own Forest Code.40

**CERRADO MANIFESTO**

The Cerrado Manifesto is a call for action from civil society stakeholders that is supported by a large and growing number of companies who use Brazilian soy or cattle in their supply chain. Companies who have signed a Statement of Support agree to work with local and international stakeholders. This includes developing an implementation plan to halt deforestation and native vegetation loss in the Cerrado.41
Many of the issues affecting soybean production affect other commodities as well. Multi-stakeholder efforts that address deforestation and other impacts related to soybean as well as other commodities include:

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

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

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

- **Soft Commodities Forum**  
  The World Business Council on Sustainable Development (WBCSD) is facilitating this pre-competitive platform among ADM, Bunge, Cargill and Louis Dreyfus, who are committed to eliminating deforestation in their supply chains. The first focus area of the Forum is tackling land use challenges in the Brazilian Cerrado. This will include recommending standards to use in the Cerrado for monitoring and traceability of land use in supply chains. The Forum will also promote development of new financial mechanisms that incentivize producers to avoid conversion of native forests and vegetation.

- **Field to Market Fieldprint Projects**  
  Field to Market: The Alliance for Sustainable Agriculture works in the U.S. with grower groups, retailers and other supply chain businesses, along with civil society, academia and public-sector partners to promote continuous improvement in row crop production practices using an outcomes-based approach. Projects in the U.S. are collecting data on several key science-based indicators, with supply chain members providing support for continuous improvement efforts by growers. Its Supply Chain Sustainability Program focuses on benchmarking current sustainability outcomes, catalyzing continuous improvement, and enabling supply chain sustainability claims.

- **Midwest Row Crop Collaborative**  
  Announced in 2016, this coalition of companies (Cargill, General Mills, Kellogg Company, Land O’ Lakes, Bayer, PepsiCo and Walmart) and conservation groups (Environmental Defense Fund, The Nature Conservancy and World Wildlife Fund) is focused on achieving the goals outlined in the Gulf Hypoxia Taskforce action plan and respective state nutrient and water loss reduction plans. The coalition will focus on three states: Illinois, Iowa and Nebraska, which produce nearly 44 percent of corn, soy and wheat. This region also sends 422 million kilograms/year of nitrogen downstream, which ultimately contributes to the annual Gulf of Mexico dead zone.
SUSTAINABILITY STANDARDS

The diversity of soybean production systems presents a major challenge for adoption of a single global standard. Five major international third-party standards apply to soybean production, including: Roundtable on Responsible Soy (RTRS), Danube Soya Initiative, ProTerra, Fairtrade and organic standards. World Wildlife Fund (WWF) has developed recommendations for buyers in animal feed, meat, dairy, food processing and retail sectors that source soybean from countries where RTRS or ProTerra standards are applicable. The International Sustainability and Carbon Certification (ISCC) and the Roundtable on Sustainable Biomaterials (RSB) cover soybean as a biofuel feedstock. U.S. producers have adopted only the organic standard, which is relevant to multiple commodities.
In order to manage the supply chain risks associated with soybean production, an increasing number of companies are developing relevant policies and codes of conduct. They are also recognizing that in order to ensure their supply meets such policies, commodity traceability is paramount. To combat deforestation in supply chains, many companies are committing to traceability not only with their direct suppliers but also in their extended supply chains.

As companies focus on traceability and implementation of their policies, they are increasingly collaborating with suppliers as well as other stakeholders. This includes finding ways to support suppliers as they take the steps needed to uphold the company's policy. Supplier support can include education and technical support, support in goal setting, or financial incentives to meet new standards. To be effective in achieving their policies, companies are also increasingly establishing a monitoring and verification process to confirm that suppliers are following through on the company’s commitments. Without verification, even the strongest policy leaves a company exposed to reputational and market risks. Verification can be conducted by the company or by a third-party certifier. Leading companies include a protocol for supplier non-compliance that facilitates time-bound action plans for suppliers to return to compliance.
SOYBEANS

COMPANIES IN ACTION

• **Unilever** sourced 72 percent of its soy oil from sustainable sources in 2017. In the U.S., soybeans are Unilever’s most important agricultural raw material, as the oil is used in Hellmann’s mayonnaise. As part of its commitment, Unilever partnered with ADM and other important stakeholders in a program that helps soy farmers and soy oil suppliers in Iowa increase the use of cover crops and qualify for cost share payments.46 This program involved around 170 farmers cropping more than 26,000 acres in 2017.47

• **McDonald’s** in Europe is striving for 100 percent sustainably certified soy in its chicken meat supply chain by 2020. In 2016, 50 percent of soy used for chicken feed in its European markets was covered by ProTerra or Roundtable on Responsible Soy certification.48

• **Smithfield**, as a pork producer which purchases large quantities of animal feed containing soybean meal, has set a goal to have 75 percent of its grain purchased go through a fertilizer optimization and soil health program by 2018. In 2016, 55 percent of Smithfield’s total grain purchases came from farmland participating in the SmithfieldGro Program and/or the Land O’Lakes' SUSTAIN™ sustainability platform.49
The U.S. Department of Agriculture conducts research on multiple commodities, including soybeans. This includes data on production and consumption, prices and trade and is published through the Economic Research Service, Foreign Agricultural Service, and National Agricultural Statistics Service.

Both The Sustainability Consortium and World Wildlife Fund offer high-level insights and analysis about potential risks and opportunities across a number of commodities, including soybeans.

A U.S. Soybean Sustainability Assurance Protocol (SSAP) has been developed by members of the soybean industry (American Soybean Association, the U.S. Soybean Export Council, the United Soybean Board and state soybean boards). It uses existing aggregated data collected from farmers nationwide who participate in national conservation programs. As of May 2016, 95 percent of U.S. soybean producers participate in the U.S. Farm Program and are subject to audit.

The Consumer Goods Forum has published multiple documents for companies to gain insight into where soybeans enter their supply chains and which product lines contribute the most to the company’s “soy footprint.” This includes The Sustainable Soy Sourcing Guidelines and Calculation guidelines for the measurement of embedded soy usage in consumer goods businesses (2016) which helps companies apply the principles of the CGF Soy Measurement Ladder published in early 2015.

ProForest is producing a Soy Toolkit, which provides companies with guidance for implementing the five key steps needed to decouple soybean production from deforestation.

Harnessing the power of global supply chains to halt deforestation driven by soy by Global Canopy and CDP lays out steps for policymakers and the private sector. The brief recommends companies map their supply chain and utilize other platforms such as Trase and Agroideal, along with initiatives such as the Global Forest Watch platform for ongoing monitoring of commodity-related risks.


Soybean overlooked? The investor case for deforestation-free soy (2015) by CDP explores the regulatory risks in Brazil for companies purchasing products containing soybean associated with deforestation, discusses the implications for investors, and provides a set of recommendations for action.

The Growth of Soy: Impacts and Solutions (2014) by World Wildlife Fund takes a deep dive into the impacts related to soybean production and provides a number of solutions for actors along the food value chain.

The United Nations Food and Agriculture Organization has published Tackling Climate Change through Livestock (2013), which provides an in-depth analysis on issues and practical solutions for reducing greenhouse gas emissions related to livestock, including those related to producing feed for livestock.
• *Respecting Land and Forest Rights: A Guide for Companies* (2015) by The Interlaken Group and the Rights and Resources Initiative (RRI) was developed through a multi-stakeholder forum to support companies in respecting land rights by aligning operations with the United Nations Food and Agriculture Organization’s Voluntary Guidelines on the Responsible Governance of Tenure (VGGT).

*Engage the Chain* offers briefs on seven other key commodities, a compelling *case* for sustainable agriculture and opportunities for action that cut across all types of agricultural commodities.
   Note: For example, expanding federal crop insurance and disaster relief programs such as the 2012 Farm Bill mean that farmers in drought-prone areas are able to risk growing highly profitable but rainfall-dependent crops such as soybeans

Note: Ranking is based on sales, as reported in Progressive Grocer, May 2018, https://progressivegrocer.com/top-50-grocers-amazon-7th-place-while-rest-industry-restragizes-reshuffles


World Resources Institute, Aqueduct, Agriculture Exposure to Water Stress, http://www.wri.org/applications/maps/agriculturemap/#x=9.84&y=24.07&l=2&v=home&d=cropland

Note: "Regions of Water Stress" are regions defined by WRI as having "high" or "extremely high" water stress


Note: Represents the combined "blue" and "green" footprints of soybeans


42  CGF is a global network that brings together the CEOs and senior management of some 400 retailers, manufacturers, service providers, and other stakeholders across 70 countries. Its member companies have combined sales of EUR 3.5 trillion.

43  The following reports provide useful information about the different standards related to soybean production.
- The State of Sustainability Initiatives Review (2014) published by IISD reports on system-level and market trends across 16 of the most important standards initiatives operating across 10 key commodity sectors.
- In Search of Responsible Soy: Key Characteristics and Comparison of Voluntary Soy Standards (2011) commissioned by the Dutch Soy Coalition, examines and compares existing sustainable soybean production standards according to their environmental and social strengths and weaknesses.
- Selecting a Biomass Certification System - a Benchmark on Level of Assurance, Costs and Benefits (2012), commissioned by the Netherlands Ministry of Economic Affairs, Agriculture, and Innovation, compares different standards and certification options.

44  Note: Organic standards are developed at the national and/or regional level through relevant organic standard setting bodies.

46  Note: Cover crops are a crop, usually a legume, planted to keep nutrients from leaching, soil from eroding, and land from weeding over, as during the winter. Source: http://www.dictionary.com/browse/cover-crop


48  Accessed June 5, 2018; https://corporate.mcdonalds.com/content/corpmcd/scale-for-good/our-food-chicken.html#goals


51  United Soybean Board, Sustainability, http://unitedsoybean.org/topics/sustainability/


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