



SSOY

PARTNERS
FOR A BETTER TOMORROW

Sustainability Overview Year 2023



*U.S. Soy farmers
play an outsized role
in building a more
sustainable future
for the planet and its
growing population.
After all, they're
responsible for
reliable, sustainable
production of the
high-quality soy that
provides food, feed,
fuel and thousands of
other products people
depend on every day.*

In fact, use of U.S. Soy enables and enhances the sustainability of companies in a wide range of industries, from consumer packaged goods and manufacturing to transportation and beyond.

These farmers are proud to be a big part of the solutions for some of society's biggest challenges: food security, renewable energy and environmental stewardship, just to name a few. But U.S. Soy farmers can't address these challenges on their own. No one can. Progress requires dedicated partnerships: organizations, businesses and individuals united to build a better future.

United Soybean Board's mission is "partnering to deliver sustainable soy solutions to every life, every day." USB and all U.S. Soy organizations are dedicated to fostering partnerships to:

- Accelerate the next wave of innovations to bolster on-farm sustainability.
- Enable and promote sustainable practices throughout the food chain.
- Develop new applications for soy-based products that provide renewable alternatives for everything from petroleum to formaldehyde to plastics.
- Research new opportunities for farmers to manage their land for both profitability and social good.

Together, we are making meaningful progress in addressing these societal challenges and opening new doors of opportunity. While we celebrate the success of our farmers, collaborators and partners, we also recognize that the next steps forward to create meaningful positive impact will be even more challenging. We will need to forge even stronger, broader and more dedicated partnerships to foster the next waves of innovation and progress.

U.S. Soy stands ready to make those next steps forward. We are strengthening existing partnerships and constantly creating new ones to discover and advance more sustainable ways to both grow and use soy. These efforts help to create more regenerative systems across industry value chains and throughout society.

In the pages that follow, we will show you how U.S. Soy farmers and their growing roster of partners are advancing sustainability on the farm, across the food chain and throughout a wide range of other industries. These technologies, tools and techniques are combined and customized by individual farmers to best match their region and operating conditions.





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PARTNERS IN

Sustainable Farming



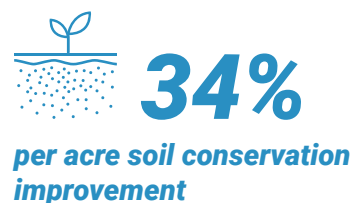
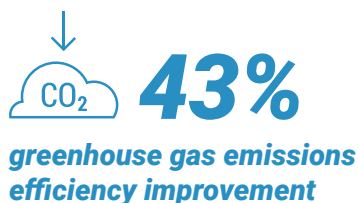
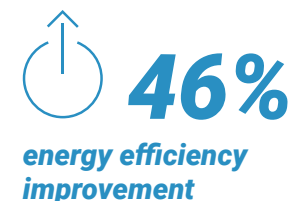
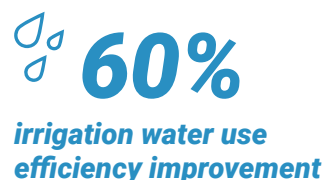
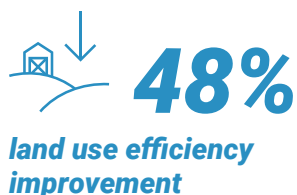
U.S. Soy farmers have always been good stewards of land, water and natural resources. After all, climate-smart farming practices not only benefit the environment, but they also lead to better harvests and increased prosperity for farmers and everyone who depends on them.

U.S. Soy farmers are making tremendous strides in maximizing the sustainability of their operations. They're deploying both groundbreaking innovations and old-fashioned common sense to help mitigate the impact of climate change on their operations, even as they reduce their own environmental footprints to help reverse that impact over time.



U.S. Soy Sustainability by the Numbers

According to the latest available data from [Field to Market](#), between 1980 and 2020, U.S. soybean farmers have improved resource efficiency per bushel:



Over the same time period, **U.S. Soy farmers have increased production of soy by 130%**, using roughly the same amount of land that has been used for decades.

Farmers for Soil Health

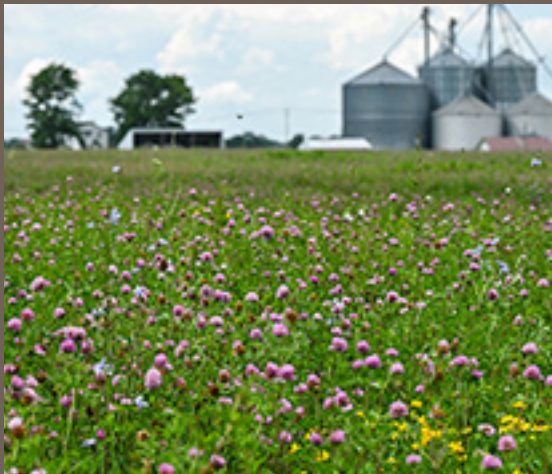
*A coalition between the United Soybean Board (USB), the National Pork Board, the National Corn Growers Association and other supporters, **Farmers for Soil Health was established to advance the use of cover crops to improve soil health, advance sustainability throughout the food value chain and improve farmer profitability.***

The coalition seeks to double the amount of corn and soybean farmland using cover crops to improve soil health and resiliency by 2030, using a baseline as reported in the most recent Census of Agriculture published in 2017.

While cover crops have proven to deliver multiple benefits over time, initial start-up challenges can be a barrier to adopting the practice. In May 2022, Farmers for Soil Health was awarded a \$95 million grant from the USDA's Partnerships for Climate-Smart Commodities to help farmers address these start-up costs, and in May 2023, the organization received \$13.6 million in grants from the National Fish and Wildlife Foundation to establish personal,

on-the-ground technical support for farmers in 20 states who are seeking to adopt cover crops. Crop advisors familiar with each state's agronomic and production environment will help farmers select cover crops that offer the most soil health benefits, minimize issues during planting and add value to their overall production efforts.

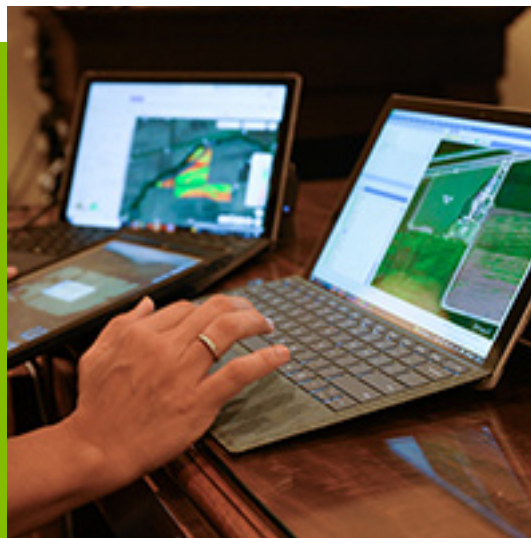
Beyond this important support in initial implementation of cover crops, Farmers for Soil Health is developing models for cost sharing and financial support for farmers implementing the practice, as well as mechanisms to measure and quantify the value of the practice over time.





Water Management

With technological advances such as center-pivot irrigation systems, weather and soil moisture sensors and water storage ponds, farmers can precisely optimize their resources to save water and improve resiliency against harsh weather. U.S. Soy helps these efforts by funding research to advance water conservation practices.



Nutrient Management

Detailed nutrient management plans and ever-evolving data and technology in precision agriculture enable U.S. Soy farmers to apply just the right amount of nutrients for their crops. This allows for reduced use of fertilizer and other inputs, more productive crops and improved soil and water quality.



Conservation Tillage (Strip-Till and No-Till)

With conservation tillage, fields are planted with little or no tilling. Conservation tilling methods help retain organic matter from the previous year's crop in the soil, improving soil nutrients and reducing moisture loss, erosion and greenhouse gas (GHG) emissions. According to the USDA, about 74% of U.S. soybean acres use conservation tillage today.

SUSTAINABLE FARMING PRACTICES



Cover Crops

By planting non-commercial crops in the off-season, U.S. Soy farmers help to add nutrients to the soil and protect the land from erosion. This practice also helps to maintain soil health and slow runoff from fields, trapping and filtering sediment, nutrients and other matter before they reach water sources.



Buffer Strips, Windbreaks and Agroforestry

Strategic use of land in and around crops helps farmers to reduce erosion and runoff, build soil health and sequester carbon dioxide while also supporting native wildlife. Agroforestry systems, which integrate trees with crops or livestock, contribute to carbon sequestration, biodiversity conservation and improved microclimates.



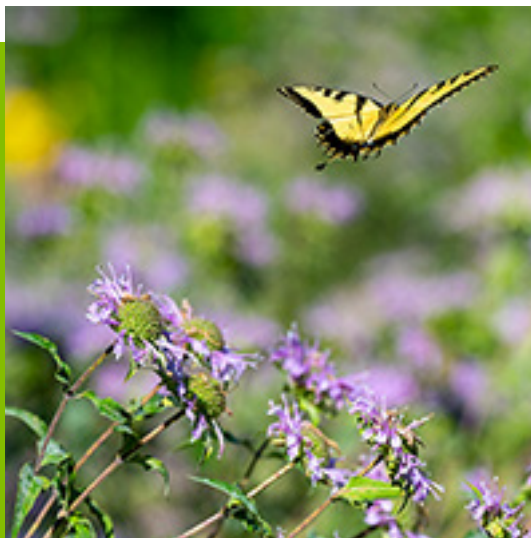
Precision Agriculture

Drones, GPS-enabled tractors, satellite imagery, guidance control and integrated pest management are just a few of the modern tools at U.S. Soy farmers' disposal. Collectively known as precision agriculture, these advances in technology help produce more soy from the same amount of land, even as they reduce use of natural resources.



Innovations in Plant Breeding and Biotechnology

Plant breeding innovation and biotechnology make weed control more effective and reduce the amount of chemicals and inputs needed to produce crops. More than 90% of the soybeans grown in the U.S. are herbicide-tolerant. These innovations also work to increase nutritional benefits for consumers, protect against extreme weather conditions and address malnutrition around the globe.



Forestry, Land Use and Biodiversity

The United States is the No. 1 country in the world for preservation of public forestry, and U.S. Soy intends to help keep it that way. Trend data from the U.S. Department of Agriculture and other sources shows that U.S. forest land is increasing, while cropland is decreasing. To support and continue these gains, U.S. Soy farmers have a long history of supporting programs to help preserve wildlife habitats, enhance forestlands, conserve pollinators and improve biodiversity.



Renewable Energy

U.S. Soy farmers don't just produce the feedstock for renewable biofuels — they are using those biofuels to replace traditional fossil fuels in powering their farm equipment. Additionally, many farmers are deploying solar and wind energy solutions to help power their operations. For a growing number of farmers, renewable energy production is becoming a new source of income as wind turbines intermingle with crops to produce renewable energy in multiple forms.



Infrastructure

The United States' transportation systems and sound infrastructure give U.S. Soy a competitive advantage no other country can boast. By leveraging U.S. Soy's shorter supply chain, the global food industry reduces its carbon footprint and transportation costs. USB investments play an important role in continued infrastructure improvements. For example, recent investments to support dredging of the lower Mississippi River will enable additional exports to meet growing demand from international customers, and bring in an estimated \$461 million in additional revenue for U.S. Soy farmers.



Future Outlook

Field To Market data shows that U.S. Soy farmers continue to make significant strides in improving efficiency in land use, irrigation and soil conservation. Additional progress has been slower in energy efficiency and greenhouse gas emissions, however.

To help farmers maintain and accelerate progress in these key measures, U.S. Soy is focused on partnerships, like those highlighted in this report, to help boost adoption of sustainable farming practices as well as to identify new opportunities to advance sustainable production. We also support ongoing educational programs to help promote societal understanding, appreciation and acceptance of modern farming best practices. Based on learnings in recent years and new opportunities on the horizon, we are evaluating updated goals and benchmarks to help us measure progress in the years ahead.

The Nature Conservancy

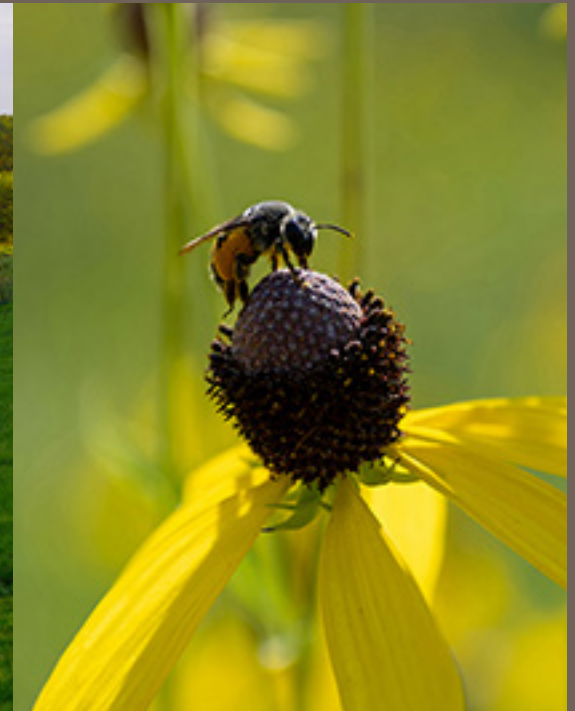
*The Nature Conservancy (TNC) is a global environmental nonprofit, **working to create a world where both people and nature can thrive.***

It was founded in the U.S. in 1951 and has grown to include more than one million members and a dedicated staff of more than 400 scientists, working with partners to advance conservation efforts in more than 79 countries and territories around the world.

USB has been proud to collaborate with TNC to help provide farmers access to technology and research designed to help them enhance on-farm sustainability efforts. TNC also serves on USB's Sustainability Advisory Council.

Together, the organizations have provided farmers with a range of resources and educational opportunities designed to help them adopt practices like conservation tillage and cover crops in ways that are both environmentally and economically sustainable.

In all of its agricultural initiatives, TNC works directly with farmers to develop sustainable solutions that work for all parties — farmers, their communities and the planet as a whole.



U.S. Soy Sustainability Assurance Protocol

The U.S. Soy Sustainability Assurance Protocol (SSAP) is a first-of-its-kind, independently audited verification program that ensures U.S. soy production is conducted using sustainability best practices. The SSAP outlines the regulations, processes and management practices that ensure sustainable soy production for environmental, social and economic sustainability outcomes over time.

Managed by the U.S. Soybean Export Council (USSEC), SSAP includes independent farm audits conducted by the USDA, and is benchmarked against sourcing guidelines of the European Feed Manufacturers' Federation (FEFAC) by the independent International Trade Centre (ITC).

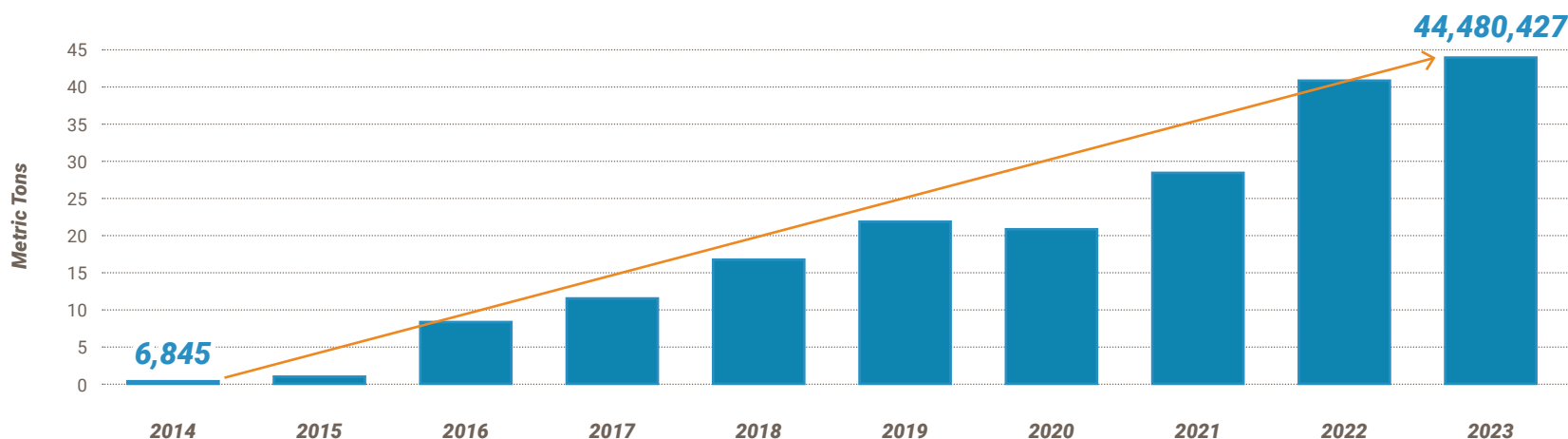
In recent years, SSAP was expanded to address guidelines under the European Union's Renewable Energy Directive (RED). SSAP-RED was recognized by the EU in 2019, enabling SSAP-RED certified U.S. soybeans to be

used as feedstock for biodiesel production in the European Union.

SSAP guidelines are constantly reviewed and updated according to metrics and feedback, helping to ensure that customers of verified U.S. Soy are advancing their own sustainability as a result.

Exponential Rise in Export Volumes Verified with U.S. Soy Sustainability Assurance Protocol (SSAP) Certificates

May 2014 – May 2022





Mapping to United Nations Sustainability Goals

These sustainable farming practices enable U.S. Soy to support the United Nations (UN) Sustainable Development Goals (SDGs), which have provided a blueprint for organizations and businesses in focusing and measuring sustainability goals since they were established in 2015.

In 2020, U.S. Soy conducted in-depth stakeholder research to map the SDGs against U.S. Soy priorities.

SDG Goal 2: Zero Hunger was identified as the primary opportunity to U.S. Soy to “move the needle.”

The top three priorities that emerged from stakeholder research, which all map to Goal 2, are:

- Soil health/carbon sequestration
- Water management
- Greenhouse gas (GHG) emissions

These priorities intersect with five other SDGs, which emphasize environmental responsibility and resilient agriculture, aligning naturally with agriculture and food production:

- Goal 6: Clean Water and Sanitation
- Goal 12: Responsible Consumption and Production
- Goal 13: Climate Action
- Goal 15: Life on Land
- Goal 17: Partnerships

We will continue to update priorities and measure our progress in alignment with the UN SDGs.



PARTNERS IN

Food Security



U.S. Soy and its customers play an important role in building food security around the globe. It starts, of course, with the high-quality protein that soy provides as both food for people and feed for animals.

But our commitment to food security goes far beyond the bean. Through research investments, educational initiatives and key partnerships, we are driving advances that expand availability and affordability of nutritious food around the world.

Complete Protein for People

U.S. Soy is an important source of complete protein, essential fats and other nutritional building blocks that make it a staple for those who desire lean or plant-based proteins in their diets. Soy directly or indirectly supports good nutrition in multiple forms.

Soy protein is considered a “complete” protein, providing all nine of the essential amino acids in amounts needed by the human body. Soybean oil, typically labeled as “vegetable oil,” provides a neutral flavor

that can easily be added to dishes or used for frying or baking. Soybean oil is the most widely used edible oil in the United States.

The incorporation of soy in the diet may support heart health across one’s lifespan. Both soy protein and soybean oil carry FDA heart health claims – and soy is the only plant protein that may be able to reduce the risk of coronary heart disease.

We continue to find new ways to incorporate soy into healthier diets. For example, high oleic soybean oil, which was pioneered by USB and industry partners, contains beneficial monounsaturated fatty acids and less saturated fat, providing a healthy alternative to many cooking oils, with greater shelf stability and longer fry life.

The 2020-2025 USDA Dietary Guidelines for Americans, which focus on encouraging healthy eating and meeting nutritional needs throughout all stages of life, **recommends soy as part of a healthy diet** across the categories of vegetables, dairy, protein foods and oils. Specifically:



Vegetables

Edamame and soybeans can help meet daily vegetable consumption recommendations, providing fiber, calcium, vitamin D, iron and potassium.



Dairy

Fortified, non-sweetened soy beverages and soy yogurt are the only non-dairy plant milk alternatives considered to be equivalent to dairy, providing vitamin D, calcium and protein.



Protein

Tofu, tempeh, protein powder and products made from soy flour, soy protein isolate and soy concentrate are included in the protein category. Soy proteins are also an important source of iron, zinc, protein and choline. The Dietary Guidelines recommend consuming soy protein each week.



Oils

Soybean oil is part of a healthy dietary pattern because it provides essential fatty acids and lower saturated fat. It is a source of vitamin E, omega-3 fatty acid and omega-6 fatty acid (polyunsaturated fat).

Soy Excellence Centers

Soy Excellence Centers (SECs) provide protein producers in developing countries around the world with workforce training and capacity-building programs to help them enhance productivity and sustainability.

SEC education, training and community-building efforts help producers create jobs and expand affordable access to protein, supporting food security, nutrition and economic growth.

With SECs covering the Americas, Asia, the Middle East, North Africa and Sub-Saharan Africa, the centers serve as hubs to share best practices in protein production using soy, with customized areas of focus based on regional needs and priorities. In Asia and Africa, for example, SECs have provided extensive training on industry best practices

in aquaculture, helping to support growing regional demand for fish and seafood-based protein. Also in Asia, a separate SEC was established to focus on soy-based protein for food, matching strong regional demand for plant-based options.

The five SECs in place today have served more than 1,300 businesses and more than 2,450 employees in more than 24 countries, since launching in 2019. The SECs are managed by USSEC, with support from USB, [American Soybean Association \(ASA\)](#) and state soy checkoff organizations.



The Sustainable U.S. Soy Brand and Logo

The Sustainable U.S. Soy brand and logo was launched by USSEC to increase global awareness of exported soybeans as a sustainable product for consumers and consumer packaged goods (CPG) companies. The mark showcases the commitment of U.S. soybean farmers and the industry to continuous environmental improvement and demonstrates how soy ingredients help CPG companies meet their own sustainability goals.

The mark is available for international customers using U.S. Soy that is certified under the SSAP program.

Superior Feed for Animals

As the population continues to grow, and as diets continue to improve in emerging economies around the world, demand for animal protein continues to grow. According to the [OECD-FAO Agricultural Outlook](#) 2023-2030, meat demand is expected to increase by 2% per capita by 2032 compared with a base period

U.S. Soy provides reliable, high-quality and sustainably grown feed to support animal protein production, making it a preferred protein.

average of 2020-2022, with chicken and pork leading this growth. Over the same period, [fish consumption](#) per capita is expected to grow by 3.7%, with the vast majority of this growth supported via aquaculture operations.

U.S. Soy provides reliable, high-quality and sustainably grown feed for animal protein producers, making it a preferred protein for chicken and pork production, as well as the rapidly emerging aquaculture industry for fish production. U.S. Soy farmers produce feed that delivers a high-quality nutrient profile that provides producers with a distinct [performance advantage](#). Extensive global [research](#) supports that U.S. soybean and soybean

meal products contain more [nutrients](#) than soybean meal of other origins.

When it comes to the rapidly expanding aquaculture industry, U.S. Soy not only provides superior feed for these operations, but we also fund research and training to help aquaculture producers maximize both production and sustainability. USSEC has spearheaded development of [In-Pond Raceway System \(IPRS\) Aquaculture Technology](#), which has been recognized as an excellent model for aquaculture production, enabling more efficient use of resources, reduced carbon footprints and higher-quality products.

7-Eleven

*Protein-packed, low-calorie tofu bars are quickly becoming a favorite snack in Japan, and 7-Eleven stores there are now **providing four delicious options made from verified-sustainable U.S. Soy.***

In March 2023, 7-Eleven's parent company, Seven & I Group, signed a licensing agreement with USSEC to use the international Sustainable U.S. Soy logo on its private Seven Premium international brand of soy products sold in stores in Japan. 7-Eleven is a leader in convenience stores in Japan, with about 21,400 stores there as part of its global footprint of about 83,000 stores.

Soybeans are essential ingredients in many traditional Japanese foods and are deeply rooted in the country's culture. At the same time, Japanese consumer interest in sustainability continues to rise. The tofu bars provide a great example of how convenience stores support the busy, functional lifestyle of the Japanese people, who demand a strong connection to their culture and to environmental responsibility.



Food+Feed+Fuel+More

As demand for renewable energy and other products surges, soy has emerged as an ideal feedstock for biofuel, as well as a renewable alternative to fossil fuels and harmful chemicals in products ranging from plastics and rubbers to asphalt and adhesives. However, these growing and emerging opportunities do nothing to diminish U.S. Soy's ability to continue advancing food security around the world. U.S. Soy can, in fact, support food security and fuel security as well.

The whole soybean is so versatile that even after using the oil for food, biomass-based diesel fuels and other uses, 80% of the bean remains as meal, or protein, available to nourish people and animals.

Complete, nourishing protein. Renewable fuel and thousands of other products. All from the same bean.

While biomass-based diesel fuels are a growing source of demand for soy, the food chain remains the top use for soy products. In 2022, the average U.S. soybean yield was roughly 50 bushels per acre, according to the USDA – the equivalent to 3,000 pounds of soybeans. Once crushed, those beans deliver enough oil and protein to provide:

- More than 50 gallons of renewable diesel fuel
- Enough edible vegetable oil to meet two people's annual oil consumption

- Enough feed for chickens to produce more than 800 pounds of broiler meat – enough to meet 10 people's annual chicken consumption

U.S. Soy is constantly innovating and collaborating with U.S. farmers and industry and corporate partners to drive ongoing sustainable growth to meet food and fuel demands – from more sustainable farming and production practices, to ongoing research on creating an even more versatile bean, to continuous ideation on soy-based products with lower carbon footprints.



The Power of a Single U.S. Soybean Harvest

In processing, soybeans are cleaned, cracked, dehulled and rolled into flakes. This ruptures the oil cells for efficient extraction to separate the oil and meal components. After removal of the soybean oil, the remaining flakes can be turned into various edible soy protein products, used to produce soybean meal for human food and animal feed. The by-products left over from this process can even be used to treat wastewater or feed cattle.

20%

oil for food, household and industrial products

80%

meal/protein for people and animals



Soy Oils



Cooking Oil, Cosmetics, Fabrics, Plastics, Rubber, Asphalt, Artificial Turf, Biodiesel, Mulch, Paint and More

Soy Meal/Protein



Feed (Dairy, Poultry, Pork and Fish), Edamame, Hi-Fiber Flour, Miso, Natto, Soymilk, Tempeh, Tofu and More

In 2022*, the U.S. soybean yield per acre was ...

50

bushels

That's equal to
3,000 lbs.
of soybeans

Once crushed, those soybeans could produce



570 lbs.

of soybean oil



2,350 lbs.

of protein

That's enough oil and protein to produce all of the following:

50 gallons

of renewable diesel fuel



Enough diesel fuel for the average semitruck to travel from NYC to Pittsburgh

2 years

of average person's vegetable oil consumption

Feed 800 lbs.

to provide
of boneless chicken,

enough to feed
10 people
chicken for a year



Aqua Internship Program

*Teach someone to fish and you can help feed them for a lifetime. Teach someone sustainable aquaculture and they could **feed entire communities — and create new jobs and economic opportunities along the way.***

That's the goal of the World Initiative for Soy in Human Health (WISHH) [aquaculture internship program](#), which provides hands-on learning opportunities for students in sub-Saharan Africa who are interested in developing careers in the fast-growing field. Since the year 2000, aquaculture production in sub-Saharan Africa has grown by 11% annually on average — almost twice as fast as other areas of the world.

The 16-week training program, hosted by Flosell Farms in Ghana, provides real-world training in highly efficient and sustainable aquaculture practices, as well as development of practical skills that can help participants establish and develop careers in an industry that directly contributes to global food security.

Supported by funding from USB and the USDA Market Access and Agricultural Trade Promotion program, WISHH sends global aquaculture experts to the farm, where they lead training programs and provide production advice. In 2023, funding from the Nebraska Soybean Board is allowing WISHH to evaluate an innovative new water aerator at Flosell Farms, helping to expose interns to the latest technology advances.

The program advances WISHH's overall mission to help build food security around the world by advancing trade and market development opportunities for U.S. Soy.



PARTNERS IN

Renewable Energy





Biofuels derived from U.S. Soy provide completely renewable, cleaner-burning alternatives to fossil fuels, helping to build energy security around the world even as they support efforts to reduce greenhouse emissions to mitigate climate change.

Cleaner-Burning Biofuels for Brighter Tomorrows

Oil from U.S. Soy provides an ideal feedstock for biodiesel, a renewable biofuel that reduces total greenhouse gas emissions by up to 86% compared with petroleum diesel. Biodiesel is the first and only fuel commercially available nationwide to meet EPA's definition of an advanced biofuel.

Biodiesel from U.S. Soy is climate-smart at every step of its lifecycle. Thanks in large part to the sustainable farming practices outlined earlier in this report, U.S. Soy farmers sequester carbon in the soil, keeping it out of the atmosphere, and they farm while also protecting the forest land

that captures additional carbon. Domestic production of biodiesel reduces the need for imports of fossil fuels. And even when biodiesel is burned, it releases fewer emissions than fossil fuels.

The biodiesel market was established in part by U.S. Soy research investments, and today that research is expanding to focus on emerging innovations like renewable diesel, which holds the potential to fuel vehicles and meet other energy needs as-is, without the need to blend it with traditional fossil fuels.

With potential applications ranging from on-road and off-road vehicles to air transportation and from electricity

generation to home heating, Clean Fuels Alliance America predicts that use of biofuels will exceed 6 billion gallons by 2030, eliminating more than 35 million metric tons of CO₂-equivalent greenhouse gas emissions annually. That's the equivalent of the annual energy consumption for more than 4.4 million homes.

With continued advances in feedstocks, the organization predicts that use will reach 15 billion gallons by 2050.

Biodiesel is the first and only fuel commercially available nationwide to meet EPA's definition of an advanced biofuel. Biodiesel from U.S. Soy is climate-smart at every step of its lifecycle.



American Lung Association Biobased Academy®

To accelerate the transition to renewable alternatives, USB partnered with the American Lung Association to develop the ALA Biobased Academy, a comprehensive online training program designed to **educate fleet and facility professionals and technicians on the operational, health, safety and environmental benefits of biobased fleet and facilities products.**

According to the American Lung Association, the academy seeks to:

- Benefit human and environmental health through reduced exposure to harsh chemicals and emissions produced through the use and production of petroleum-based products.
- Assist organizations in achieving health and environmental goals with biobased fleet products.
- Increase professional knowledge of biobased fleet products and associated benefits.
- Contribute to the U.S. economy by increasing the use and sale of biobased products produced from domestic renewable resources, with emphasis on biobased products made from soy.
- Educate leading fleet professionals and assist in the implementation of sustainable, cutting-edge fleet best practices and biobased products to create ideal candidates for local, state, national, and international awards and certifications.

More than 100 fleet professionals from 43 communities and organizations have completed the program since it was launched in October 2022. Graduates have credited the program with expediting their fleets' transition to more sustainable fuel, as well as spurring adoption of additional soy-based products ranging from tires to grease.



PARTNERS IN

Sustainable Products



U.S. Soy may be best-known for food, feed and fuel, but research innovations in recent years have paved the way for its expanding use by companies producing thousands of other products that touch our lives every day.

Soy is quickly emerging as a key, renewable ingredient replacing fossil fuels and harmful chemicals in everything from plastic and rubber to adhesives and household products.

USDA research estimates that biobased products from soy and other renewable sources replaced as much as 9.4 million barrels of oil equivalents in 2017, and reduced CO₂ emissions by as much as 12.7 million metric tons in the same year.

Thanks in part to USB-funded research, new product applications for soy are being developed every day.

Renewable and Biodegradable Plastics

Over the past 70-plus years, plastics have resulted in countless product innovations and new conveniences that have improved our lives. However, these advances have

also left us with two urgent environmental challenges. First, traditional plastics are made from fossil fuels using processes that resulted in about 1.8 billion tons of greenhouse gas emissions in 2019. Second, plastic waste can take up to 400 years to break down in a landfill — and society produces around 400 million tons of plastic waste per year. By comparison, bioplastics are being made today that break down in as little as one to two years.

U.S. Soy is quickly expanding as a more renewable and biodegradable option for many types of plastics. Soy-based plastic replacements are showing up in everything from consumer goods packaging to biodegradable plates and flatware to artificial turf. Soy-based resins are even emerging to sustainably power rapidly advancing 3D printing technologies, which are poised to revolutionize manufacturing in a wide range of industries in the years ahead.

Soy-based plastic replacements are showing up in everything from consumer goods packaging to biodegradable plates and flatware to artificial turf.

SYNLawn

Imagine a lawn that you never have to mow. Or water. Or weed. Or fertilize. *Sounds good, doesn't it? Even more so when you consider that eliminating all those activities is also good for the environment.*

SYNLawn, with support from USB, is making these dreams a reality, and they're doing so with synthetic turf that uses up to 88% renewable materials, including U.S. Soy. Today, SYNLawn is showing up everywhere from residential front yards to golf courses and from parks to road medians, providing an attractive and virtually maintenance-free alternative for homeowners, businesses and communities. Since 2008, SYNLawn's distributors have installed more than 150 million square feet of soy-backed turf across 300,000 installations.

In 2020, SYNLawn became the first synthetic turf company to receive a bio-preferred certified installation system from

the U.S. Department of Agriculture (USDA). They have continued to receive additional USDA Certified Biobased Product labels for their product offerings.

The environmental and economic savings of synthetic turf are significant at every level, from residential front lawns to large community institutions. One SYNLawn customer, The Children's Museum of Indianapolis, estimates that the use of SYNLawn at their 7.5-acre attraction, Riley Children's Health Sports Legends Experience, has resulted in savings of 840,000 gallons of water annually, as well as diversion of CO₂ emissions, equivalent to 168 hours of car exhaust.





Rubber

Soy-based alternatives are rapidly emerging to replace petroleum-based rubber products. Soy-based rubber is used today for everything from tires to shoe soles. Soy-based rubber not only provides a renewable option, but it has been shown to deliver improved performance, such as better tire traction and flexibility in cold weather.

Adhesives

Due in part to research funded by USB, soy-based products now provide a sustainable and safer alternative to adhesives traditionally made with formaldehyde, a known carcinogen. These soy-based solutions are now used in applications ranging from plywood to fiberglass insulation, and from product packaging to flooring.

Soy-based adhesive solutions have proven to deliver multiple sustainability and performance advantages; in plywood, for example, they require less drying time, use less water and produce less waste than traditional solutions.

Goodyear

Advancing their goal to eliminate use of petroleum-based oils by 2040, **Goodyear is making great strides in use of soy-based solutions** in several of its tire lines.

Most recently, in early 2023 Goodyear announced a new demonstration tire made of 90% sustainable materials, including U.S. Soy.

These advances, supported in part by USB research, enable Goodyear to not only realize significant progress in sustainability, but also to deliver better-performing tires. The company has found that tires built with soy-based components can provide better traction and increased

flexibility in cold weather when compared with counterparts made with petroleum products.

Thanks to a subsequent collaboration between Goodyear and Skechers, consumers can now enjoy the benefits of similar soy-based rubber on both their cars and their feet. Skechers recently introduced multiple shoe styles that feature Goodyear Performance Outsoles, delivering superior grip, stability and durability.





Household Products

U.S. Soy products are a staple in many kitchens, but they can also be found in virtually every room in your home. These soy solutions often replace petroleum products, and in many cases reduce the emission of volatile organic compounds (VOCs) from chemicals, which could have short- and long-term adverse health effects.

Consider just a few examples of where renewable soy products might be in your home today:

- Soy-based foam is frequently used in couch cushions and mattresses.
- Carpets using soy can replace up to 90% of the petroleum-based polymers traditionally used.
- Many household cleaners use soy-based ingredients.
- Soy-based grease and lubricants can help keep household appliances and tools running smoothly.
- Soy ingredients are used in a wide variety of paints, stains and sealers.
- A growing number of personal care products — from skin creams to mosquito repellants — are using soy-based ingredients.

PARTNERS IN

Research



Virtually all of the innovations and products featured in this report were enabled or advanced via research funded by U.S. Soy farmers through USB, USSEC, ASA and state checkoff organizations.

U.S. Soy supports dozens of research projects annually, advancing sustainability and productivity on the farm, enhancing food security and nutrition for people and animals, and developing new uses for renewable U.S. Soy products.

All told, USB has provided millions of dollars in funding for research projects in fiscal year 2023.

Advancing Sustainability on the Farm

Through collaboration with leading universities, non-government organizations and industry partners, U.S. Soy funding has supported advances in seed genetics research, advances in precision farming and digital tools, sustainable farming practices like cover crops and no-till/strip-till farming, and water management and conservation.

Research to Advance Food Security

Over the years, USB-funded research has opened new doors to advance food security and good nutrition for both people and animals.

For human nutrition, this research has led to advances like high oleic soybean oil, which provides lower saturated fat and increased beneficial fatty acids that benefit heart health when consumed in moderation, earning it two qualified health claims from the FDA.

In animal nutrition, research projects have helped to ensure that animal producers are getting optimal efficiency in converting soy protein to animal protein, thereby conserving the amount of land and resources needed.



Coalition Launches First-of-Its-Kind Research Aiming to Improve Soy Yields by 10-15%

*In January 2023, USB, along with four regional checkoff organizations and four major universities, **launched a three-year project aimed at reducing the impact of drought on soybean plants.***

In normal years, soybean plants drop about 30% of their flowers over the course of a season, but in drought conditions, that number can rise to 80%, severely impacting soybean yields.

Over the course of the project, researchers will evaluate performance of 250 genotypes with publicly available data to determine the best genetic combinations to improve flower retention. Ultimately, the coalition's goal is to develop new seed varieties that increase flower and pod retention by 20% to 30% under drought conditions, which in turn could enhance yields by 10% to 15%.

This opportunity could result in up to \$400 million in additional value for soybean farmers, as well as tremendous benefit for society as a whole, as new opportunities are unlocked to produce more soybeans on the same amount of land, and with no additional natural resources required.

Coalition partners include The Atlantic Soybean Council, Mid-South Soybean Board, North Central Soybean Research Program, Southern Soybean Research Program, Texas Tech University, Kansas State University, the University of Missouri and the University of Tennessee. Research is led by Principal Investigator Krishna Jagadish at Texas Tech.





Research in Sustainable Products

USB-funded research has played a key role in opening new markets for soy and providing more sustainable alternatives for a wide array of products we depend on every day. This work is ongoing, as research partners explore and develop new applications ranging from mulch and asphalt to groundwater remediation and, yes, even cat litter.

Research in Renewable Energy

Shortly after USB was founded in 1990, interest in biofuels began to surge. USB-supported research helped to launch and build the nascent industry into the renewable energy powerhouse that it is today. USB-funded research continues to propel biofuels forward, with recent studies focused on advancing new uses for soy-powered energy solutions.



Soy Innovation Challenge

With growth in renewable biofuels creating surging demand for soybean oil in recent years, U.S. Soy farmers found themselves with a proverbial “good problem:” how could the food value chain make the most out of resulting increased supplies of soybean meal?

Through USB, farmers decided to enlist the help of the ag-tech start-up community to address the challenge. USB, in partnership with the Yield Lab Institute, launched the second Soy Innovation Challenge in October 2022, offering a \$100,000 prize to the most promising emerging technology designed to add value to the soy meal market.

In May 2023, Satavie was announced as the winner of the Soy Innovation Challenge. Satavie was selected out of nearly 80 applicants from around the world for their

approach to extract concentrated soy protein from soybean meal. Their method ensures high levels of digestibility, improved nutrient absorption and increased feed conversion rates ideal for swine, poultry and aquaculture feed.

Satavie’s innovations show tremendous promise for boosting the value of soybean meal feed, helping to ensure that U.S. Soy farmers are maximizing sustainability with every part of every bean they grow.



Clean Fuels Alliance America

Recent USB-supported research conducted by Clean Fuels Alliance America and Trinity Consultants explored the **potential health benefits of shifting to 100% biodiesel for transportation and home heating in 15 U.S. cities.**

Using EPA models and other established risk assessment processes, the study found tremendous potential for improved health, as well as resulting economic benefits. Specifically, the study found that total conversion to biodiesel could result in:

- More than 456,000 fewer/reduced asthma cases per year
- More than 142,000 fewer sick days per year
- Cancer cases reduced by nearly 9,400 over a 70-year timeframe
- The prevention of more than 910 premature deaths per year
- Over \$7.5 billion in avoided health costs annually
- A 45% reduction in cancer risk when legacy heavy-duty trucks such as older semis use B100, and an 86% reduced risk when biodiesel is used for home heating oil, known as Bioheat® fuel





PARTNERS FOR A BETTER TOMORROW

While significant progress has been made in efforts to build both food security and sustainability around the world, U.S. Soy farmers know that continued focus and broad collaboration is needed to continue our advancement toward safe and healthier products for our planet and your family.

The U.S. Soy industry is committed to continual advancement of sustainable practices on the farm, and to continue to seek out partners across the spectrum of food, fuel, renewable products and beyond. We welcome any and all potential partners to join us so we can work together to achieve these objectives.

A man in a light blue button-down shirt and jeans is walking on a concrete path. To his left is a large, dark, corrugated metal structure, possibly a soybean bin. To his right is a vast field of green soybean plants. In the background, there is a line of trees under a bright, hazy sky, suggesting a sunset or sunrise. The overall scene conveys a sense of agricultural sustainability.

US SOY

For more information about the sustainability
of U.S. Soy, visit ussoy.org