Jobs & Economic Impact of a Billion-Ton Bioeconomy

Bioenergy can play an important role in reducing U.S. dependence on foreign sources of energy in a sustainable, reliable, and cost-effective manner—while strengthening national security, generating jobs and economic activity across America, and protecting our country's valuable natural resources.

Bioenergy is a true homegrown resource that uses readily available, non-food biomass resources from American farms, forests, and waste streams to produce a variety of end products. Like other renewable energy resources, biomass can be converted into power; however, unlike other resources, it can also be converted into transportation fuels, products, and high-value chemicals—making it unique among all other renewable energy sources. The economic activity derived from utilizing these biobased resources is commonly referred to as the bioeconomy.

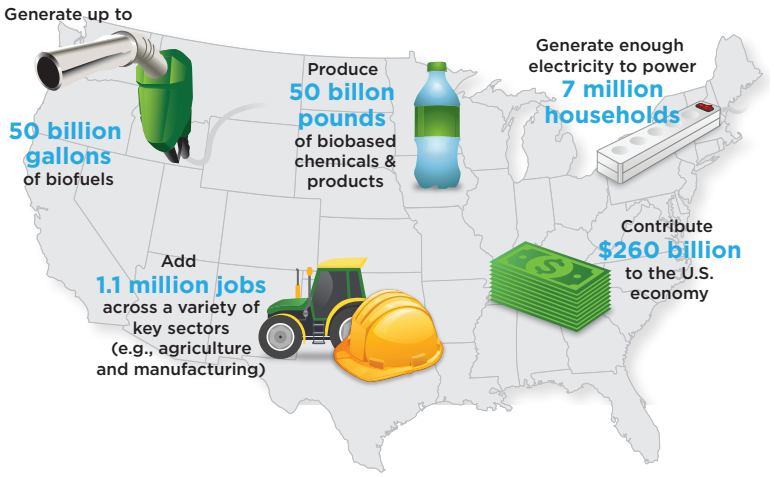
A significantly larger U.S. bioeconomy will require new and greatly expanded production systems and networks to efficiently grow, harvest, and transport large quantities of sustainable biomass. The industry also needs technologies to more efficiently and economically convert biomass for a variety of end-use applications. These demands create employment opportunities and stimulate economic development for Americans in a broad range of fields, from scientific research to plant operations, farming, and equipment design. These are jobs that cannot be outsourced.

The Bioeconomy as an Economic Engine

As production expands beyond ethanol to include a wide range of advanced biofuels and bioproducts, the bioeconomy could become a powerful jobs and economic stimulus. The bioeconomy will require skilled workers to build and upgrade infrastructures and develop new biomass resources and products. Due to the purchase of goods and services, each job and dollar generated directly by the bioeconomy will result in additional jobs and economic impacts in related industries. The current bioeconomy is estimated to have directly generated more than $48 billion in revenue and 285,000 jobs.[1] Even by conservative estimates, this could expand by a factor of five to contribute more than $259 billion and 1.1 million jobs to the U.S. economy by 2030.[1]

[1] J. N. Rogers, B. Stokes, J. Dunn, H. Cai, M. Wu, Z. Haq, and H. Baumes, "An Assessment of the Potential Products and Economic and Environmental Impacts Resulting from a Billion Ton Bioeconomy," *Biofuels, Bioproducts, and Biorefining* 11, no. 1 (2017): 110–128, doi:10.1002/bbb.1728.

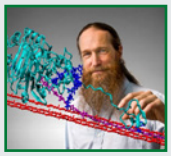
Annual U.S. Bioeconomy Potential



By 2030, the United States has the potential to produce 1 billion tons of biomass annually without disrupting food and feed markets or negatively impacting the environment.

Diverse Employment Opportunities

The availability of skilled workers at all levels is critical to successfully grow the U.S. bioeconomy. There are a number of careers available in a variety of key sectors. For example:



Engineering & Manufacturing

This sector helps develop processes to improve the logistics of harvesting and transporting biomass, improve the efficiency of converting biomass into an end product, and design mechanical systems for energy or automotive applications.

Agriculture, Life, & Physical Sciences

Individuals in these fields ensure bioenergy production systems deliver high-quality biomass while remaining environmentally sustainable. Many are also at the forefront of innovation, optimizing important biological and chemical applications.

Infrastructure

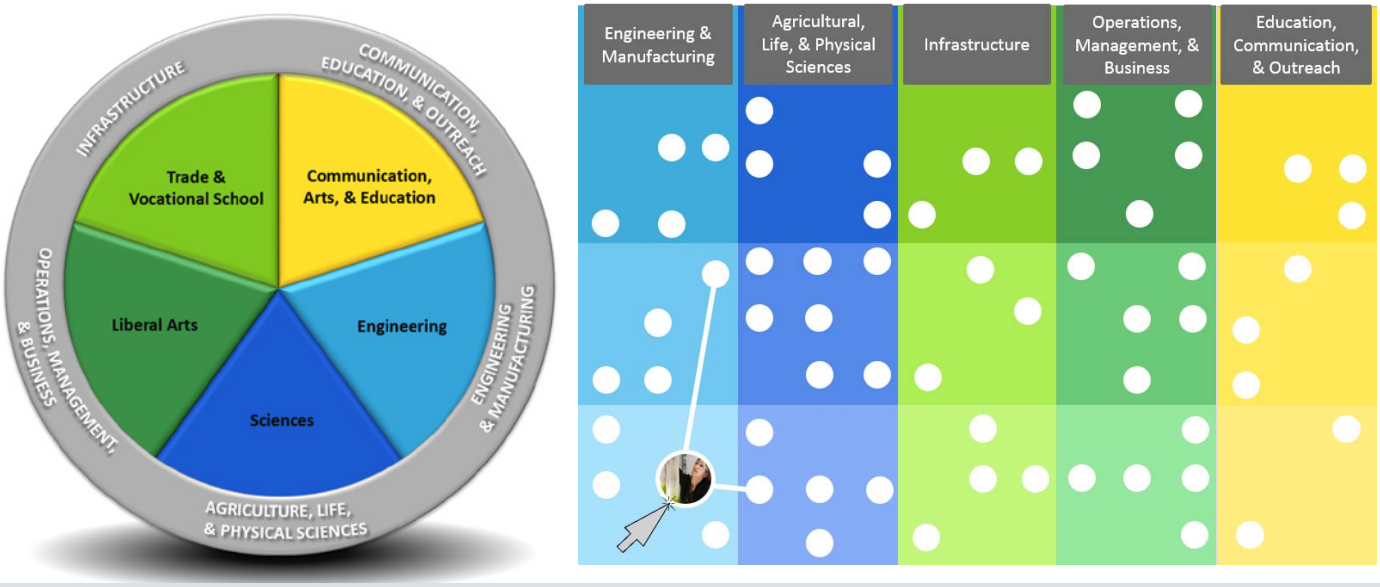
This sector assists in constructing and maintaining bioenergy infrastructure (e.g., biomass processing facilities, biorefineries, upgrading facilities) and distribution (e.g., pipelines, gas pumps, transportation vehicles).

Operations, Management, & Business

The business arm of the industry plays an integral role in maintaining overall economic sustainability. These individuals manage day-to-day operations and finances, cultivate new investments, and focus on end-use sales and marketing.

Education, Communication, & Outreach

Educators and communicators are essential to keep the public and policymakers informed about technological breakthroughs and advancements in bioenergy research and development.



The Bioenergy Career Map is an interactive tool that explores the growing network of bioenergy occupations, illustrates potential career pathways, and identifies the education and training necessary for each career. Visit energy.gov/eere/bioenergy/bioenergy-career-exploration-wheel to discover career opportunities in the bioenergy industry.

Stimulating Workforce Development

The U.S. Department of Energy's (DOE's) Bioenergy Technologies Office (BETO) is actively working with public and private partners to meet these technology needs and facilitate the growth of a robust, domestic bioindustry. Through cost-shared research and development, BETO develops advanced technologies and real-world solutions. Workforce expansion is an important ancillary benefit of these efforts. BETO is working with diverse partners to help develop the workforce needed to support the evolving bioeconomy.

The growing U.S. bioindustry is creates opportunities for workers with a wide range of skills and supports the national strategy to develop diverse domestic energy resources. *Photo courtesy of Verenium.*

One key component of the BETO Education and Workforce Development Program is to assist individuals in understanding the careers, education, and training that are available to advance the bioenergy industry. The Bioenergy Career Map is an interactive tool that explores the growing network of bioenergy occupations, illustrates potential career pathways, and identifies the education and training necessary for each career. The career map profiles more than 60 positions and 100 routes of advancement among careers that span across five subsectors of the bioenergy industry (engineering and manufacturing; agriculture, life, and physical sciences; infrastructure; operations, management, and business; and education, communication, and outreach).

DOE offers internship and fellowship programs in partnership with the American Association for the Advancement of Science and the Oak Ridge Institute for Science and Education. Other opportunities include the Presidential Management Fellows program, DOE Scholars Program, Office of Energy Efficiency and Renewable Energy Student Volunteer Internship Program, and DOE Minority Educational Institution Student Partnership Program. Interns and fellows contribute their knowledge and skills to federal agencies while networking with their peers. ■