

# IMPACT:

## The Bioeconomy

**SNAPSHOT:** An evolving economy

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# YES!

## The World has an Evolving Bioeconomy

### WHAT WE KNOW.

Most would think that the “bioeconomy” is centered on health and medical biotechnology. However, the emerging and evolving BIOECONOMY is holistic — growing to include BIOBASED products.

While there are many definitions, the USDA defines BIOBASED PRODUCTS: “Biobased products are derived from plants and other renewable agricultural, marine, and forestry materials. Biobased products provide an alternative to conventional petroleum-derived products that include a diverse range of offerings such as lubricants, detergents, inks, fertilizers, and bioplastics. Biobased products also include biobased intermediate and ‘upstream’ materials such as bioresins or biopolymers, or feedstocks such as succinic acid.”

The world’s largest biotechnology industry association, BIO, states: *“Industrial biotechnology applies life science tools, such as microbes and enzymes, to traditional manufacturing and chemical processes to produce biobased, or cleaner, more sustainable products and materials.”*

By 2017, USDA-Nexant Renewable Chemicals Market Assessment PROJECTIONS ARE that the growing opportunities through biobased products amount to \$775 million of value added per year for renewable chemicals with capital investment of \$2.4 billion. By 2022, the value added potential is estimated at \$3 billion per year with \$6 billion capital.

The industrial biotechnology sector is building an economy in which renewable resources and waste streams are being converted into energy, chemicals and everyday consumer goods. Biorefinery production is in its earliest stage.



Building a  
sustainable  
future and  
economy with  
nature-inspired  
solutions.

## DEVELOPMENT

For more than two decades, advancements have continued in industrial biotechnology applications. Europe has led the way in this emerging and evolving industry. Biobased technologies and strategies have evolved and improved for navigating the changing science, market and policy landscape. For years, BIOBASED PRODUCTS have had a role in the product supply chain, and in a changing economy — from biorefineries in India to biopolymers used in car seats and drinking bottles, biobased products have come to be known collectively as: INDUSTRIAL BIOTECHNOLOGY.

The growing use of these products and a growth of Industrial Biotechnology globally — coupled with biobased components and products such as pharmaceuticals — has created a phenomenon that is producing opportunities through an evolving BIOECONOMY.

The U.S. government has created programs including the BioPreferred and USDA Certified Biobased Product labels; through this, there have been 97 different categories of biobased items that can be purchased, with more than 10,000 biobased products now available on the open market.

# GREEN CHEMISTRY

“This is the future of chemistry.”

The American Chemical Society

...

- The U.S. total bioindustry revenue could reach \$250 billion annually, with a total economic impact of more than \$660 billion each year
- The European bioeconomy is now more than \$2.1 trillion
- The number of U.S. bioeconomy jobs in 2013 was about 4 million
- The U.S. economy has added more than \$369 billion from the biobased products industry in 2013
- The U.S. jobs multiplier is: 2.64. For every one job, 1.64 more jobs are created in this industry
- The U.S. government has invested more than \$320 million in biobased research at three bioenergy research centers
- Farm-to-Fly is a program established that is spurring the sale of more than 1 billion gallons of blended fuel
- 2,250 products now carry the USDA Certified Biobased label 
- 480,000 acres of biomass has been planted and funded by USDA

SOURCE: U.S. Federal Accounts Report on Bioenergy February 2016

## WHAT WE THINK WE KNOW.

Projections are just that, projections. The projections for Industrial Biotechnology and its growth are ONLY projected given the demands of an increasingly ‘sensitive’ environment, and a collective global community in need of these solutions and demanding them.

This is good news for business — existing and new. Technologies and the products being generated are creating additional sources and resources for existing business: pharmaceutical to petrochemical. An ‘evolving’ industry, bioeconomy opportunities for small business and entrepreneurs — research to product development — seem limitless.

- **Research & Development:** This is an area just now receiving attention from the private investment community. Government investment has led the way — creating knowledge and technology to fully leverage inputs and applications.
- **Regulation:** The regulatory environment is catching up. There is increasing support for biobased products; for example, USDA's BioPreferred program and DOE's Bioenergy Technologies Office.
- **Technology:** Technology is being applied to crops, feedstocks, existing refineries and processing facilities to increase yield. Technology is actually ahead of investment.
- **Investment & Entrepreneurship:** As compared to biotechnology applications in medicine or energy, opportunities are more numerous in the biobased space and the apparatus for development and distribution does exist, and time-to-market is much less. For example, BIOBASED LUBRICANTS have been utilized for over a decade.
- **Growth for Manufacturing:** A renaissance perhaps — a ‘new’ manufacturing opportunity with process technologies put to work at existing facilities; and, NEW manufacturing possibilities, including: additive.
- **Export Opportunities:** There is high demand for biobased products and bioenergy solutions worldwide where pollution is staggering and water is scarce.
- **Market Adoption:** BIOECONOMY — the word is out. Government and industry are working together to create solutions and bring the consumer along; access, value & benefits — to the environment AND the economy.

# THE BIOECONOMY

## DEVELOPMENT FORECAST

Lifestyle and technology are connected in the evolving bioeconomy — awareness and investment are driving its future.

### INNOVATION

Innovation is growing, with opportunities in: engineering, agriculture, systems design, environmental science...Innovation will push these environmental solutions forward.

### GLOBAL

Global needs are driving demand: pollution in India, water shortages in Africa, water contamination in the U.S., as well as needed control over feedstock.

### INVESTMENT

Public and private investment is growing — the opportunities exist: market acceptance, regulatory support and the economic viability of the industry. Focus: technology, product enhancement and distribution, NOT facilities.

### REGULATORY

The regulatory environment must further evolve. This will be led by a competitive industry marketplace, not consumer demand.

### REGIONAL

A regional-specific approach is needed. It must be based on crops available, transportation modes and availability, climate impact; and it must be focused around the development of microgrids.

### BIOBASED

“Biobased” will overtake “organic.” Industry demand — driven by input costs, tightening regulations, a growing entrepreneurial environment — will turn consumers and markets to: biobased.

***“Choose only one master — Nature.”***

**– Rembrandt**

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