

Biomanufacturing & Synthetic Biology Market Forecasts to 2034 – Global Analysis By Technology Platforms (Precision Fermentation, Cell-Based Biomanufacturing, Cell-Free Biomanufacturing, Metabolic Engineering, Protein Engineering, Genome Engineering, AI-Driven Biological Design, Enzyme Engineering), Product Types, Biological Systems, Applications, End Users and By Geography

<https://marketpublishers.com/r/B61CC79E9B99EN.html>

Date: October 2026

Pages: 200

Price: US\$ 4,150.00 (Single User License)

ID: B61CC79E9B99EN

Abstracts

According to Statistics MRC, the Global Biomanufacturing & Synthetic Biology Market is accounted for \$15.5 billion in 2026 and is expected to reach \$45.2 billion by 2034 growing at a CAGR of 14.3% during the forecast period. Biomanufacturing and synthetic biology involve the application of engineering principles to biological systems to design, construct, and optimize living organisms for the production of valuable materials, chemicals, and therapeutics. They function by reprogramming cellular machinery, such as bacteria, yeast, or mammalian cells, to synthesize target compounds with high precision and efficiency. These technologies encompass precision fermentation, metabolic engineering, and AI-driven biological design. Their application ensures sustainable production of biofuels, alternative proteins, and pharmaceuticals, reducing reliance on traditional petrochemical processes globally.

Market Dynamics:

Driver:

Rising Demand for Sustainable and Bio-Based Alternatives

The escalating demand for sustainable and bio-based alternatives compels manufacturers to adopt biomanufacturing and synthetic biology solutions offering advanced production alternatives. Growing recognition of petrochemical environmental impacts is accelerating the integration of these biological systems into manufacturing frameworks. This transition is supported by advancements in metabolic engineering, which enhance cellular yield and efficiency. Consequently, enterprises are investing in synthetic biology technologies to achieve compliance with sustainability benchmarks while optimizing overall production costs.

Restraint:

Complex Regulatory Pathways and Scale-Up Challenges

The substantial expenses associated with scaling up advanced biomanufacturing and synthetic biology processes represent a significant barrier to widespread commercial adoption. Transitioning from laboratory-scale fermentation to industrial-scale bioreactors often requires complex process engineering and specialized technical expertise, which escalate overall implementation costs. Furthermore, the variability in biological systems limits the operational predictability of standardized production models. These factors collectively constrain market expansion, particularly for smaller enterprises with limited technology budgets.

Opportunity:

Expansion in Alternative Proteins and Biofuels

The alternative proteins and biofuels sectors present substantial growth opportunities for biomanufacturing and synthetic biology providers due to increasing demand for sustainable consumer goods. Advanced biological platforms offer a highly effective pathway to produce high-value compounds without extensive land use, utilizing precision fermentation as primary inputs. As global investments in green technology expand, the adoption of advanced synthetic biology solutions is expected to surge significantly.

Threat:

Competition from Traditional Petrochemical Manufacturing

The continuous reliance on traditional petrochemical manufacturing processes poses a considerable threat to the biomanufacturing and synthetic biology market. Conventional chemical synthesis often exhibits superior scalability and can be more cost-effective for

facilities producing high-volume, commodity-grade materials. Additionally, the rapid advancement of basic chemical processing tools is enhancing the efficiency of conventional manufacturing methods. This competitive pressure may hinder market penetration in less specialized applications.

Covid-19 Impact:

The pandemic initially disrupted biomanufacturing deployments and delayed clinical trials due to supply chain constraints. However, the subsequent need for rapid vaccine and therapeutic production accelerated the adoption of synthetic biology solutions for resilient operations. Post-pandemic, the heightened focus on supply chain agility and operational efficiency has reinforced long-term investments in biomanufacturing technologies, driving robust market recovery and expansion across diverse industrial sectors globally.

The precision fermentation segment is expected to be the largest during the forecast period

The precision fermentation segment is expected to account for the largest market share during the forecast period, due to its unparalleled production efficiency and widespread applicability across diverse biomanufacturing environments. Precision fermentation offers exceptional cellular yield and operates effectively in complex biological conditions, which significantly reduces production time and minimizes resource consumption in daily manufacturing processes. As industries increasingly prioritize scalable and cost-effective bio-based production methods, the demand for specialized precision fermentation technologies continues to surge, thereby solidifying their dominant market position.

The AI-driven biological design segment is expected to have the highest CAGR during the forecast period

Over the forecast period, the AI-driven biological design segment is predicted to witness the highest growth rate, driven by rapid advancements in machine learning and genomic sequencing techniques. These technologies enable the precise optimization of cellular pathways to produce highly specialized and robust biological outputs tailored for specific industrial applications. The ability to enhance production yield, operational scalability, and metabolic efficiency through advanced AI integration significantly improves process economics, accelerating commercial adoption globally.

Region with largest share:

During the forecast period, the North America region is expected to hold the largest market share, due to the presence of well-established biotechnology sectors and advanced research infrastructure that heavily utilize biomanufacturing and synthetic biology. The region benefits from substantial research and development investments, robust intellectual property protection, and supportive government initiatives promoting sustainable manufacturing and technological innovation. Furthermore, the early adoption of advanced synthetic biology technologies by key industry players in the United States and Canada reinforces the region's dominant position globally.

Region with highest CAGR:

Over the forecast period, the Asia Pacific region is anticipated to exhibit the highest CAGR, due to rapid industrialization and expanding biotechnology sectors in emerging economies. Countries such as China, India, and Japan are increasingly investing in biomanufacturing infrastructure and advanced automation technologies to meet growing domestic production demands and stringent sustainability regulations. Additionally, favorable government policies, rising foreign direct investment, and the availability of cost-effective technological resources are collectively driving the accelerated adoption of synthetic biology across the region.

Key players in the market

Some of the key players in Biomanufacturing & Synthetic Biology Market include Novonesis A/S, DSM-Firmenich AG, Lonza Group AG, Thermo Fisher Scientific Inc., Danaher Corporation, Merck KGaA, Sartorius AG, Evonik Industries AG, BASF SE, Agilent Technologies, Inc., Bio-Rad Laboratories, Inc., Ginkgo Bioworks Holdings, Inc., Twist Bioscience Corporation, Codexis, Inc., Illumina, Inc., LanzaTech Global, Inc., GenScript Biotech Corporation, and Recursion Pharmaceuticals, Inc.

Key Developments:

In September 2026, Novonesis A/S launched a next-generation precision fermentation platform optimized for bio-based chemical production, achieving a thirty percent improvement in cellular yield while significantly reducing resource consumption requirements for global biomanufacturing operators.

In August 2026, DSM-Firmenich AG expanded its synthetic biology capacity through a

strategic partnership with a leading genomics firm, enabling the scalable deployment of novel metabolic engineering modules for sustainable ingredient production.

In July 2026, Ginkgo Bioworks Holdings, Inc. secured a major supply agreement to provide customized biological design services for a prominent pharmaceutical company, facilitating the efficient integration of advanced synthetic biology tools into next-generation therapeutic ecosystems globally.

Technology Platforms Covered:

Precision Fermentation

Cell-Based Biomanufacturing

Cell-Free Biomanufacturing

Metabolic Engineering

Protein Engineering

Genome Engineering

AI-Driven Biological Design

Enzyme Engineering

Product Types Covered:

Biopharmaceuticals

Industrial Enzymes

Biofuels

Biochemicals

Bioplastics and Biomaterials

Alternative Proteins

Agricultural Biologicals

Biological Systems Covered:

Bacteria

Yeast

Fungi

Mammalian Cells

Plant Cells

Cell-Free Systems

Engineered Microbial Consortia

Applications Covered:

Pharmaceutical Manufacturing

Industrial Enzyme Production

Food and Alternative Protein Production

Biofuel Production

Biochemical Manufacturing

Bioplastics Manufacturing

Agricultural Biotechnology

Environmental Biotechnology

End Users Covered:

Pharmaceutical and Biotechnology Companies

Contract Development and Manufacturing Organizations (CDMOs)

Food and Beverage Companies

Chemical Companies

Industrial Biotechnology Companies

Agricultural Biotechnology Companies

Research Institutions

Consumer Products Companies

Regions Covered:

North America

United States

Canada

Mexico

Europe

United Kingdom

Germany

France

Italy

Spain

Netherlands

Belgium

Sweden

Switzerland

Poland

Rest of Europe

Asia Pacific

China

Japan

India

South Korea

Australia

Indonesia

Thailand

Malaysia

Singapore

Vietnam

Rest of Asia Pacific

South America

Brazil

Argentina

Colombia

Chile

Peru

Rest of South America

Rest of the World (RoW)

Middle East

Saudi Arabia

United Arab Emirates

Qatar

Israel

Rest of Middle East

Africa

South Africa

Egypt

Morocco

Rest of Africa

What our report offers:

Market share assessments for the regional and country-level segments

Strategic recommendations for the new entrants

Covers Market data for the years 2023, 2024, 2025, 2026, 2027, 2028, 2030, 2032 and 2034

Market Trends (Drivers, Constraints, Opportunities, Threats, Challenges, Investment Opportunities, and recommendations)

Strategic recommendations in key business segments based on the market estimations

Competitive landscaping mapping the key common trends

Company profiling with detailed strategies, financials, and recent developments

Supply chain trends mapping the latest technological advancements

Free Customization Offerings:

All the customers of this report will be entitled to receive one of the following free customization options:

Company Profiling

Comprehensive profiling of additional market players (up to 3)

SWOT Analysis of key players (up to 3)

Regional Segmentation

Market estimations, Forecasts and CAGR of any prominent country as per the client's interest (Note: Depends on feasibility check)

Competitive Benchmarking

Benchmarking of key players based on product portfolio, geographical presence, and strategic alliances

Contents

1 EXECUTIVE SUMMARY

- 1.1 Market Snapshot and Key Highlights
- 1.2 Growth Drivers, Challenges, and Opportunities
- 1.3 Competitive Landscape Overview
- 1.4 Strategic Insights and Recommendations

2 RESEARCH FRAMEWORK

- 2.1 Study Objectives and Scope
- 2.2 Stakeholder Analysis
- 2.3 Research Assumptions and Limitations
- 2.4 Research Methodology
 - 2.4.1 Data Collection (Primary and Secondary)
 - 2.4.2 Data Modeling and Estimation Techniques
 - 2.4.3 Data Validation and Triangulation
 - 2.4.4 Analytical and Forecasting Approach

3 MARKET DYNAMICS AND TREND ANALYSIS

- 3.1 Market Definition and Structure
- 3.2 Key Market Drivers
- 3.3 Market Restraints and Challenges
- 3.4 Growth Opportunities and Investment Hotspots
- 3.5 Industry Threats and Risk Assessment
- 3.6 Technology and Innovation Landscape
- 3.7 Emerging and High-Growth Markets
- 3.8 Regulatory and Policy Environment
- 3.9 Impact of COVID-19 and Recovery Outlook

4 COMPETITIVE AND STRATEGIC ASSESSMENT

- 4.1 Porter's Five Forces Analysis
 - 4.1.1 Supplier Bargaining Power
 - 4.1.2 Buyer Bargaining Power
 - 4.1.3 Threat of Substitutes
 - 4.1.4 Threat of New Entrants

- 4.1.5 Competitive Rivalry
- 4.2 Market Share Analysis of Key Players
- 4.3 Product Benchmarking and Performance Comparison

5 GLOBAL BIOMANUFACTURING & SYNTHETIC BIOLOGY MARKET, BY TECHNOLOGY PLATFORM

- 5.1 Precision Fermentation
 - 5.1.1 Microbial Fermentation
 - 5.1.2 Yeast-Based Fermentation
 - 5.1.3 Bacterial Fermentation
 - 5.1.4 Fungal Fermentation
- 5.2 Cell-Based Biomanufacturing
 - 5.2.1 Mammalian Cell Culture
 - 5.2.2 Microbial Cell Culture
 - 5.2.3 Plant Cell Culture
- 5.3 Cell-Free Biomanufacturing
- 5.4 Metabolic Engineering
- 5.5 Protein Engineering
- 5.6 Genome Engineering
- 5.7 AI-Driven Biological Design
- 5.8 Enzyme Engineering

6 GLOBAL BIOMANUFACTURING & SYNTHETIC BIOLOGY MARKET, BY PRODUCT TYPE

- 6.1 Biopharmaceuticals
 - 6.1.1 Monoclonal Antibodies
 - 6.1.2 Recombinant Proteins
 - 6.1.3 Vaccines
 - 6.1.4 Cell and Gene Therapies
- 6.2 Industrial Enzymes
- 6.3 Biofuels
 - 6.3.1 Bioethanol
 - 6.3.2 Biodiesel
 - 6.3.3 Sustainable Aviation Fuel
- 6.4 Biochemicals
- 6.5 Bioplastics and Biomaterials
- 6.6 Alternative Proteins

6.7 Agricultural Biologicals

7 GLOBAL BIOMANUFACTURING & SYNTHETIC BIOLOGY MARKET, BY BIOLOGICAL SYSTEM

7.1 Bacteria

7.2 Yeast

7.3 Fungi

7.4 Mammalian Cells

7.5 Plant Cells

7.6 Cell-Free Systems

7.7 Engineered Microbial Consortia

8 GLOBAL BIOMANUFACTURING & SYNTHETIC BIOLOGY MARKET, BY APPLICATION

8.1 Pharmaceutical Manufacturing

8.2 Industrial Enzyme Production

8.3 Food and Alternative Protein Production

8.4 Biofuel Production

8.5 Biochemical Manufacturing

8.6 Bioplastics Manufacturing

8.7 Agricultural Biotechnology

8.8 Environmental Biotechnology

9 GLOBAL BIOMANUFACTURING & SYNTHETIC BIOLOGY MARKET, BY END USER

9.1 Pharmaceutical and Biotechnology Companies

9.2 Contract Development and Manufacturing Organizations

9.3 Food and Beverage Companies

9.4 Chemical Companies

9.5 Industrial Biotechnology Companies

9.6 Agricultural Biotechnology Companies

9.7 Research Institutions

9.8 Consumer Products Companies

10 GLOBAL BIOMANUFACTURING & SYNTHETIC BIOLOGY MARKET, BY GEOGRAPHY

- 10.1 North America
 - 10.1.1 United States
 - 10.1.2 Canada
 - 10.1.3 Mexico
- 10.2 Europe
 - 10.2.1 United Kingdom
 - 10.2.2 Germany
 - 10.2.3 France
 - 10.2.4 Italy
 - 10.2.5 Spain
 - 10.2.6 Netherlands
 - 10.2.7 Belgium
 - 10.2.8 Sweden
 - 10.2.9 Switzerland
 - 10.2.10 Poland
 - 10.2.11 Rest of Europe
- 10.3 Asia Pacific
 - 10.3.1 China
 - 10.3.2 Japan
 - 10.3.3 India
 - 10.3.4 South Korea
 - 10.3.5 Australia
 - 10.3.6 Indonesia
 - 10.3.7 Thailand
 - 10.3.8 Malaysia
 - 10.3.9 Singapore
 - 10.3.10 Vietnam
 - 10.3.11 Rest of Asia Pacific
- 10.4 South America
 - 10.4.1 Brazil
 - 10.4.2 Argentina
 - 10.4.3 Colombia
 - 10.4.4 Chile
 - 10.4.5 Peru
 - 10.4.6 Rest of South America
- 10.5 Rest of the World (RoW)
 - 10.5.1 Middle East
 - 10.5.1.1 Saudi Arabia

10.5.1.2 United Arab Emirates

10.5.1.3 Qatar

10.5.1.4 Israel

10.5.1.5 Rest of Middle East

10.5.2 Africa

10.5.2.1 South Africa

10.5.2.2 Egypt

10.5.2.3 Morocco

10.5.2.4 Rest of Africa

11 STRATEGIC MARKET INTELLIGENCE

11.1 Industry Value Network and Supply Chain Assessment

11.2 White-Space and Opportunity Mapping

11.3 Product Evolution and Market Life Cycle Analysis

11.4 Channel, Distributor, and Go-to-Market Assessment

12 INDUSTRY DEVELOPMENTS AND STRATEGIC INITIATIVES

12.1 Mergers and Acquisitions

12.2 Partnerships, Alliances, and Joint Ventures

12.3 New Product Launches and Certifications

12.4 Capacity Expansion and Investments

12.5 Other Strategic Initiatives

13 COMPANY PROFILING

13.1 Novonesis A/S

13.2 DSM-Firmenich AG

13.3 Lonza Group AG

13.4 Thermo Fisher Scientific Inc.

13.5 Danaher Corporation

13.6 Merck KGaA

13.7 Sartorius AG

13.8 Evonik Industries AG

13.9 BASF SE

13.10 Agilent Technologies, Inc.

13.11 Bio-Rad Laboratories, Inc.

13.12 Ginkgo Bioworks Holdings, Inc.

13.13 Twist Bioscience Corporation

13.14 Codexis, Inc.

13.15 Illumina, Inc.

13.16 LanzaTech Global, Inc.

13.17 GenScript Biotech Corporation

13.18 Recursion Pharmaceuticals, Inc.

List of Tables

Table 1 Global Biomanufacturing & Synthetic Biology Market Outlook, By Region (2023-2034) (\$MN)

Table 2 Global Biomanufacturing & Synthetic Biology Market Outlook, By Technology Platform (2023-2034) (\$MN)

Table 3 Global Biomanufacturing & Synthetic Biology Market Outlook, By Precision Fermentation (2023-2034) (\$MN)

Table 4 Global Biomanufacturing & Synthetic Biology Market Outlook, By Cell-Based Biomanufacturing (2023-2034) (\$MN)

Table 5 Global Biomanufacturing & Synthetic Biology Market Outlook, By Cell-Free Biomanufacturing (2023-2034) (\$MN)

Table 6 Global Biomanufacturing & Synthetic Biology Market Outlook, By Metabolic Engineering (2023-2034) (\$MN)

Table 7 Global Biomanufacturing & Synthetic Biology Market Outlook, By Protein Engineering (2023-2034) (\$MN)

Table 8 Global Biomanufacturing & Synthetic Biology Market Outlook, By Genome Engineering (2023-2034) (\$MN)

Table 9 Global Biomanufacturing & Synthetic Biology Market Outlook, By AI-Driven Biological Design (2023-2034) (\$MN)

Table 10 Global Biomanufacturing & Synthetic Biology Market Outlook, By Enzyme Engineering (2023-2034) (\$MN)

Table 11 Global Biomanufacturing & Synthetic Biology Market Outlook, By Product Type (2023-2034) (\$MN)

Table 12 Global Biomanufacturing & Synthetic Biology Market Outlook, By Biopharmaceuticals (2023-2034) (\$MN)

Table 13 Global Biomanufacturing & Synthetic Biology Market Outlook, By Industrial Enzymes (2023-2034) (\$MN)

Table 14 Global Biomanufacturing & Synthetic Biology Market Outlook, By Biofuels (2023-2034) (\$MN)

Table 15 Global Biomanufacturing & Synthetic Biology Market Outlook, By Biochemicals (2023-2034) (\$MN)

Table 16 Global Biomanufacturing & Synthetic Biology Market Outlook, By Bioplastics and Biomaterials (2023-2034) (\$MN)

Table 17 Global Biomanufacturing & Synthetic Biology Market Outlook, By Alternative Proteins (2023-2034) (\$MN)

Table 18 Global Biomanufacturing & Synthetic Biology Market Outlook, By Agricultural Biologicals (2023-2034) (\$MN)

Table 19 Global Biomanufacturing & Synthetic Biology Market Outlook, By Biological System (2023-2034) (\$MN)

Table 20 Global Biomanufacturing & Synthetic Biology Market Outlook, By Bacteria (2023-2034) (\$MN)

Table 21 Global Biomanufacturing & Synthetic Biology Market Outlook, By Yeast (2023-2034) (\$MN)

Table 22 Global Biomanufacturing & Synthetic Biology Market Outlook, By Fungi (2023-2034) (\$MN)

Table 23 Global Biomanufacturing & Synthetic Biology Market Outlook, By Mammalian Cells (2023-2034) (\$MN)

Table 24 Global Biomanufacturing & Synthetic Biology Market Outlook, By Plant Cells (2023-2034) (\$MN)

Table 25 Global Biomanufacturing & Synthetic Biology Market Outlook, By Cell-Free Systems (2023-2034) (\$MN)

Table 26 Global Biomanufacturing & Synthetic Biology Market Outlook, By Engineered Microbial Consortia (2023-2034) (\$MN)

Table 27 Global Biomanufacturing & Synthetic Biology Market Outlook, By Application (2023-2034) (\$MN)

Table 28 Global Biomanufacturing & Synthetic Biology Market Outlook, By Pharmaceutical Manufacturing (2023-2034) (\$MN)

Table 29 Global Biomanufacturing & Synthetic Biology Market Outlook, By Industrial Enzyme Production (2023-2034) (\$MN)

Table 30 Global Biomanufacturing & Synthetic Biology Market Outlook, By Food and Alternative Protein Production (2023-2034) (\$MN)

Table 31 Global Biomanufacturing & Synthetic Biology Market Outlook, By Biofuel Production (2023-2034) (\$MN)

Table 32 Global Biomanufacturing & Synthetic Biology Market Outlook, By Biochemical Manufacturing (2023-2034) (\$MN)

Table 33 Global Biomanufacturing & Synthetic Biology Market Outlook, By Bioplastics Manufacturing (2023-2034) (\$MN)

Table 34 Global Biomanufacturing & Synthetic Biology Market Outlook, By Agricultural Biotechnology (2023-2034) (\$MN)

Table 35 Global Biomanufacturing & Synthetic Biology Market Outlook, By Environmental Biotechnology (2023-2034) (\$MN)

Table 36 Global Biomanufacturing & Synthetic Biology Market Outlook, By End User

(2023-2034) (\$MN)

Table 37 Global Biomanufacturing & Synthetic Biology Market Outlook, By Pharmaceutical and Biotechnology Companies (2023-2034) (\$MN)

Table 38 Global Biomanufacturing & Synthetic Biology Market Outlook, By Contract Development and Manufacturing Organizations (2023-2034) (\$MN)

Table 39 Global Biomanufacturing & Synthetic Biology Market Outlook, By Food and Beverage Companies (2023-2034) (\$MN)

Table 40 Global Biomanufacturing & Synthetic Biology Market Outlook, By Chemical Companies (2023-2034) (\$MN)

Table 41 Global Biomanufacturing & Synthetic Biology Market Outlook, By Industrial Biotechnology Companies (2023-2034) (\$MN)

Table 42 Global Biomanufacturing & Synthetic Biology Market Outlook, By Agricultural Biotechnology Companies (2023-2034) (\$MN)

Table 43 Global Biomanufacturing & Synthetic Biology Market Outlook, By Research Institutions (2023-2034) (\$MN)

Table 44 Global Biomanufacturing & Synthetic Biology Market Outlook, By Consumer Products Companies (2023-2034) (\$MN)

Note: Tables for North America, Europe, APAC, South America, and Rest of the World (RoW) Regions are also represented in the same manner as above.

I would like to order

Product name: Biomanufacturing & Synthetic Biology Market Forecasts to 2034 – Global Analysis By Technology Platforms (Precision Fermentation, Cell-Based Biomanufacturing, Cell-Free Biomanufacturing, Metabolic Engineering, Protein Engineering, Genome Engineering, AI-Driven Biological Design, Enzyme Engineering), Product Types, Biological Systems, Applications, End Users and By Geography

Product link: <https://marketpublishers.com/r/B61CC79E9B99EN.html>

Price: US\$ 4,150.00 (Single User License / Electronic Delivery)

If you want to order Corporate License or Hard Copy, please, contact our Customer Service:

info@marketpublishers.com

Payment

To pay by Credit Card (Visa, MasterCard, American Express, PayPal), please, click button on product page <https://marketpublishers.com/r/B61CC79E9B99EN.html>