

Global Biofertilizers Market - Types, Microorganisms and Applications

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Abstracts

Global Biofertilizers Market Trends and Outlook

Biofertilizers are natural agricultural inputs containing live microorganisms - such as bacteria, fungi, or algae - that promote plant growth by enhancing the availability of essential nutrients. When applied to seeds, soil, or plant surfaces, these beneficial microbes colonize the rhizosphere or plant tissue and aid nutrient uptake through processes like nitrogen fixation, phosphorus solubilization, potassium mobilization, and the synthesis of growth-promoting substances. In doing so, they improve soil fertility, boost crop yields, and support long-term soil health by restoring natural nutrient cycles and increasing organic matter. Common biofertilizer types include nitrogen-fixing bacteria (e.g., *Rhizobium*, *Azospirillum*, *Azotobacter*), phosphate-solubilizing microbes, mycorrhizal fungi, and blue-green algae. Typically produced by culturing selected microbial strains with carrier materials, they are applied via seed treatment, soil incorporation, or foliar spraying. While not a full substitute for chemical fertilizers, biofertilizers significantly reduce dependency on synthetic inputs, offering a more sustainable, cost-effective, and environmentally friendly alternative - especially for cereals, pulses, oilseeds, fruits, and vegetables.

The global biofertilizers market is witnessing strong momentum, estimated at US\$2.6 billion in 2024 and projected to surpass US\$5.1 billion by 2030, registering a CAGR of 12.3% during 2024-2030. This growth is driven by expanding organic farming, rising environmental concerns tied to chemical fertilizer use, and increasing demand for pesticide-free produce. Government incentives, organic agriculture mandates, and national sustainability programs are boosting adoption worldwide. Advances in microbial formulation, digital application technologies, and precision agriculture have enhanced product efficacy and usability. The expanding organic food sector, increasing farmer

awareness of soil regeneration, and integration with sustainable practices like micro-irrigation and integrated pest management are further accelerating uptake - especially across Asia Pacific, Europe, and South America. Strategic collaborations, agri-tech innovations, and digital advisory services are also reshaping the competitive landscape and reinforcing long-term market growth.

Biofertilizers Regional Market Analysis

North America holds the largest share of the global biofertilizers market at 36.8% in 2024, driven by advanced farming practices, strong regulatory support, and rising consumer demand for organic food. The United States leads regional growth, supported by USDA programs, precision agriculture, and extensive research & development in sustainable inputs. Farmers are increasingly adopting biofertilizers to enhance soil fertility, reduce chemical dependency, and improve crop resilience, aided by widespread access to modern irrigation and fertigation systems. Conversely, Asia Pacific is expected to register the fastest CAGR of 13.5% during the forecast period 2024 to 2030, fueled by population growth, increasing food demand, and a strong shift toward organic cultivation. India and China dominate due to government subsidies, integrated nutrient management schemes, and a large base of smallholder farmers adopting low-cost, eco-friendly inputs. Rising awareness of environmental and health hazards due to synthetic fertilizers, combined with the growth of organic farming initiatives, positions the Asia Pacific region as the primary driver for the biofertilizers market.

Biofertilizers Market Analysis by Type

The nitrogen fixation segment captures the largest portion of the global biofertilizers market in 2024, accounting for 70.3%, due to its vital function in improving soil fertility and increasing crop yields by converting atmospheric nitrogen into a form usable by plants. Nitrogen-fixing biofertilizers such as *Rhizobium*, *Azotobacter*, and *Azospirillum* are commonly used for major crops like rice, wheat, and oilseeds. They help reduce dependence on synthetic fertilizers, lower input costs, and support sustainable agricultural practices. Their capacity to enhance nutrient absorption, encourage plant growth, and rejuvenate soil health positions them as the preferred option for the nitrogen-deficient soils. On the other hand, the phosphate-solubilizing segment is projected to experience the fastest growth with a CAGR of 13.3% from 2024 to 2030, fueled by the crucial function of phosphorus in plant metabolism and the increasing necessity to tackle phosphorus lock-up in soils. These biofertilizers use microbial activity to convert insoluble phosphates into accessible nutrients, improving both soil fertility and crop quality. The increased awareness regarding the environmental consequences

of phosphate runoff, in conjunction with the growing use of sustainable agricultural inputs and government backing, is driving the demand for phosphate-solubilizing biofertilizers in both emerging and developed markets.

Biofertilizers Market Analysis by Microorganism Type

The rhizobium segment dominates the global biofertilizers market by microorganism type, with a projected 26.2% share in 2024, due to its key role in nitrogen fixation and improving soil fertility. Rhizobium forms symbiotic relationships with leguminous crops such as soybeans, peas, and beans by converting atmospheric nitrogen into a form that plants can absorb, thereby improving yields and reducing reliance on synthetic fertilizers. Beyond nitrogen fixation, rhizobium supports plant growth through phosphate solubilization and soil health improvement, making it a preferred biofertilizer in sustainable agriculture. Its cost-effectiveness, environmental safety, and broad applicability across legume crops contribute to its market dominance. In contrast, the Mycorrhiza (including VAM) segment is expected to witness the fastest CAGR of 13.3% from 2024 to 2030, driven by its ability to enhance nutrient absorption, particularly phosphorus, improve plant resistance to drought and soil stress, and promote better root system development. The rapid growth of this segment is driven by the rising adoption of organic farming, increased awareness of soil microbiome health, and the expanding use of Mycorrhizal fungi in integrated nutrient management practices.

Biofertilizers Market Analysis by Application

In 2024, the seed treatment segment leads the biofertilizers market by application, accounting for an estimated 61.2% share, driven by its efficiency in enhancing seed germination, nutrient uptake, and early plant development. This method directly delivers beneficial microbes such as Rhizobium, Azotobacter, and Azospirillum to seeds, promoting nitrogen fixation and phosphorus solubilization while reducing the need for costly synthetic fertilizers. Its widespread use in cereals and oilseeds, combined with rising demand for sustainable inputs and regulatory pressure to limit synthetic fertilizers, sustains its dominance. Seed treatment also protects seedlings from soil-borne diseases and ensures targeted microbial colonization. Conversely, the soil treatment segment is projected to register the fastest CAGR of 12.8% from 2024 to 2030, driven by its ability to enhance soil fertility, nutrient absorption, and overall crop resilience. This growth is further supported by the need to rehabilitate degraded soils, improve soil organic matter, and boost long-term agricultural productivity through biological amendments. Government policies, such as India's Integrated Plant Nutrition Management Bill, along with the rising adoption of organic and environmentally

sustainable farming practices, are also accelerating the segment's expansion.

Biofertilizers Market Analysis by Crop Type

In 2024, the cereals and grains segment holds the largest share of 46.2% in the biofertilizers market by crop type, fueled by the strong global demand for organic staples such as wheat, rice, and maize, as well as the significant land area dedicated to their cultivation. The dominance of this segment is bolstered by a growing consumer inclination towards chemical-free crops, government initiatives that support sustainable farming practices, and an increasing awareness of soil degradation resulting from synthetic fertilizers. Biofertilizers such as Rhizobium promote nitrogen fixation and enhance nutrient absorption, making them essential for cereal and grain production. Their wide adaptability to various agro-climatic conditions also facilitates their extensive use. In contrast, the oilseeds & pulses segment is anticipated to witness the fastest CAGR of 12.9% between 2024 and 2030, driven by the rising demand for organic oils, plant-based protein sources, and favorable policy measures that promote the use of biofertilizers.

Biofertilizers Market Report Scope

This report on Biofertilizers analyzes the global and regional markets based on type, microorganism type, application, and crop type for the period 2021-2030 with forecasts from 2024 to 2030 in terms of value in US\$. In addition to providing profiles of major companies operating in this space, the latest corporate and industrial developments have been covered to offer a clear panorama of how and where the market is progressing.

Key Metrics

Historical Period: 2021-2024

Base Year: 2024

Forecast Period: 2024-2030

Units: Value market in US\$

Companies Mentioned: 16

Biofertilizers Market by Geographic Region

North America (The United States, Canada, and Mexico)

Europe (Germany, France, United Kingdom, Italy, Spain, and Rest of Europe)

Asia-Pacific (Japan, China, India, South Korea, and Rest of Asia-Pacific)

South America (Brazil, Argentina, and Rest of South America)

Rest of World

Biofertilizers Market by Type

Nitrogen-Fixing

Phosphate-Solubilizing

Potassium-Mobilizing

Other Types (Including Zinc-Solubilizing, Sulfur-Oxidizing, Silica-Solubilizing, Iron-Chelating Organisms, and Mixed Microbial Formulations)

Biofertilizers Market by Microorganism Type

Rhizobium

Azospirillum

Azotobacter

Mycorrhiza (including VAM)

Bacillus & Pseudomonas

Others (Including Frateuria aurantia, Cyanobacteria, Azolla, and Emerging Strains)

Biofertilizers Market by Application

Foliar Spray

Soil Treatment

Seed Treatment

Other Applications (Including Root Drenching, Drip Irrigation, Fertigation and Others)

Biofertilizers Market by Crop Type

Cereals & Grains

Oil Seeds & Pulses

Fruits & Vegetables

Other Crop Types (Including Plantation Crops, Forage Crops, Turf, and Ornamental Plants, and Others)

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3. KEY MARKET PLAYERS

- AeroVironment, Inc.
- Air Product
- Airbus

Apus Group
Ballard Power Systems, Inc.
Bloom Energy Corp
Ceres Power
Cummins, Inc.
Doosan Fuel Cell Co Ltd
EnergyOR Technologies, Inc.
GKN Aerospace Services Ltd
H3 Dynamics
HES Energy Systems Pte Ltd
Honeywell International, Inc.
Horizon Fuel Cell Technologies Pte Ltd
Hydrogenics Corp
Intelligent Energy
Iwatani Corp
Linde
Nuvera Fuel Cells LLC
Piasecki Aircraft Corp
Plug Power
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Methanol

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Aircraft Fuel Cells Technology Market Overview by Global Region

Alkaline Fuel Cells (AFCs)

Direct Methanol Fuel Cells (DMFCs)

Proton Exchange Membrane Fuel Cells (PEMFCs)

Solid Oxide Fuel Cells (SOFCs)

Global Aircraft Fuel Cells Market Overview by Power Output

Aircraft Fuel Cells Power Output Market Overview by Global Region

0-100 kW

100 kW-1 MW

1 MW & Above

Global Aircraft Fuel Cells Market Overview by Application

Aircraft Fuel Cells Application Market Overview by Global Region

Auxiliary Power Units (APUs)

Emergency Power Systems

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Aircraft Fuel Cells Aircraft Type Market Overview by Global Region

Commercial Aircraft

General Aviation Aircraft

Military Aircraft

Other Aircraft (Primarily UAVs)

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