

Rhizobium Biofertilizer Market Assessment, By Formulation [Liquid, Solid], By Crop Type [Cereals and Grains, Pulses and Oilseeds, Fruits and Vegetables, Others], By Application [Seed Treatment, Soil Treatment], By End-user [Residential, Commercial], By Region, Opportunities and Forecast, 2018-2032F

Market Report | 2025-02-19 | 223 pages | Market Xcel - Markets and Data

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Report description:

Global rhizobium biofertilizer market is projected to witness a CAGR of 10.95% during the forecast period 2025-2032, growing from USD 740 million in 2024 to USD 1699.22 million in 2032. The market has seen a significant growth rate in the last few years owing to the increasing emphasis on sustainable agriculture and soil fertility enhancement with minimum use of chemical fertilizers. Rhizobium biofertilizers contain symbiotic nitrogen-fixing bacteria, which are useful and inseparable for any leguminous crop. In this context, rhizobium biofertilizers are used as a natural means of enriching the nitrogen fixed by the atmosphere into the soil, improving the quality of crop yield and minimizing the environmental impact.

The increasing demand for organic food, and the increasing knowledge of detrimental effects that the application of chemicals may have on the health of soil have significantly improved rhizobium biofertilizer usage. Across the world, governments and related agricultural organizations achieve biofertilizer promotion through subsidies, training courses, and awareness campaigns in addressing issues of food security and environmental sustainability. Furthermore, technological advancements in biotechnology and microbial formulation techniques have improved the efficiency of such biofertilizers, and the agents in which they are stored to remain available to farmers.

The transitions in adopting regenerative agricultural practices and biofertilizers as components of precision farming solutions will likely stimulate new paths for market growth. However, the awareness of small-scale farmers and constraints in storage and application techniques in some areas still hinder factors.

However, the global rhizobium biofertilizer market is anticipated to expand vigorously with continued research and development activities and increasing usage of biological solutions in modern agriculture. This market is expected to facilitate global goals in the acquisition of sustainable agricultural methods.

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In September 2024, a Memorandum of Understanding was signed between Krishak Bharati Cooperative Limited (KRIBHCO) and Novonosis (a JV formed by the Novozymes Group and the Chr. Hansen Group) to forge a long-term alliance to investigate engagement opportunities in agri biosolutions to potentially enhance crop yields and improve soil quality. The first scheme of this partnership will enable all Indian farmers to access the internationally advanced Mycorrhizal Biofertilizer product - 'KRIBHCO Rhizosuper', supplemented with Novonosis' proprietary LCO (Lipo- chitooligosaccharides) Promoter Technology, across all crops.

Growing Need for Higher Agricultural Output Catalyzes Market Expansion

To meet the growing demand for higher agricultural yield, there is a noticeable surge in demand for rhizobium biofertilizers. As the world population continuously grows, an increasing urban population demands different types of food, compelling farmers to produce more crops without adding space under cultivation. Additionally, conventional fertilizers are damagingly beneficial. Hence, they cause considerable environmental loss in terms of soil degradation, water pollution, and greenhouse gas emissions. Rhizobium biofertilizers are a sustainable alternative because they add fertility to the soil by means of biological nitrogen fixation, particularly in leguminous crops. In July 2024, as the current model leguminous plant, Lotus japonicus was studied by the scientists of the National Institute for Basic Biology, Hokkaido University, Nara Institute of Science and Technology, RIKEN, Kwansai Gakuin University, and Aichi University of Education, to conclude that the interaction between legume roots and rhizobia happens on periodic gene expression under a rhythm of six hours. This rhythmic gene expression has an effect on the regions of root sensibility to rhizobial infection and the distribution of nodules. Another point discovered is that the plant hormone cytokinin is essential to maintaining this rhythm of gene expression.

Thus, these biofertilizers reduce artificial inputs and enable high productivity without soil de-conditioning or the possibility of disturbing future sustainability.

Advancements in Biotechnology Influence the Market Growth

The rhizobium biofertilizer market is largely advanced by advancements in biotechnology, increasing the efficiency, adaptability, and accessibility of these biological solutions. The biotechnological revolution has enabled the development of genetically superior nitrogen-fixing strains of rhizobium for specific crops, soil conditions, and climatic variations so that they can perform better as biofertilizers. This makes biofertilizers more reliable and appealing to farmers by switching from chemical fertilizers to more sustainable options. There have been developments in microbial formulation technologies, which include encapsulation and liquid forms, to prolong the periods and ease of usage for rhizobium biofertilizers, thus giving them higher chances of adoption by farmers. In July 2024, Rovensa Next developed a soil-renewing biofertilizer called Wiibio, which contains rhizobacteria and has biostimulant properties in an effort to enhance plant development. Wiibio, which benefits the producers by stimulating the natural plant growth cycle, is healthy for soil health and vitality.

Moreover, advances in genomics and proteomics have enhanced the comprehension of plant-microbe interactions toward developing biofertilizers capable of augmenting nutrient uptake by the plants and ensuring plant defense against several environmental assaults such as drought and salinity. Linking rhizobium biofertilizers with precision agriculture systems via smart delivery systems would enhance optimal application and maximize benefits.

Commercial Usage Segment Holds a Significant Market Share

Most of the commercial usage segment in the market for rhizobium biofertilizers is due to the increasing popularity of sustainable agricultural practice among large-scale farming operations and agribusinesses. Many commercial farms are credited for a large fraction of crop production across nations, and therefore, switching to biofertilizers for crop production would not only increase yields but lessen their carbon footprints. Rhizobium biofertilizers are famous for their larger-scale cultivation of legumes as they enhance nitrogen fixation naturally, thereby improving soil fertility and crop productivity. Thus, this input is essential for on-farm usage by large-scale growers seeking the optimization of resources and consistent results.

In August 2023, United Kingdom-based Bionema Group Limited introduced four biofertilizer products for improving plant nutrition in commercial usage. Encapsulated in the new Incapsulex technology platform, the BioNFix range and Rhizosafe comprise Azospirillum lipoferum BNL714, Paenibacillus azotofixans BNL1913, Rhizophagus irregularis BNL2414, and Bradyrhizobium japonicum BNL1061. Technology makes it possible to encapsulate and deliver natural microorganisms on target safely and effectively.

Organic and eco-friendly produce has made commercial farmers integrate biofertilizers into their practices to meet consumer demand and regulatory requirements. Besides, government policies promoting the sustainability of agriculture and providing

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subsidies for biofertilizer use have made it economically feasible for commercial users to shift from chemical fertilizers.

North America Dominates the Market

North America continues to dominate the rhizobium biofertilizer market at the regional level due to its advanced agriculture, commitment to sustainability, and huge backing for innovative farming technologies. This, paired with biological adoption in the United States and Canada, leads to a surge in the demand for improved crop yields and lowered environmental impacts. The knowledge of the rhizobium biofertilizers and their benefits, such as increased nitrogen fixation and soil fertility, has influenced the farmers of North America.

Government policies supporting sustainable agriculture and organic farming are vital to market growth. An upward trend in people's demand for organically produced food has been observed in the region. According to a USDA study released in November 2023, there were 4.89 million acres of organic-certified land in the United States as of 2021. Additionally, more government funding has been authorized during the last 20 years to support USDA initiatives that advance organic research. The required spending authorization for the Organic Agriculture Research and Extension Initiative has grown from USD 3 million in 2002 to USD 50 million in 2023.

Furthermore, biofertilizers have been included in farming practices through grants and awareness campaigns. Strong research and development have majorly aided the advancement of microbial biotechnology in North America to develop better and well-formulated rhizobium.

Future Market Scenario (2025 – 2032F)

□□The increasing importance of sustainable agriculture is expected to result in a growing application of biofertilizers as one of the mechanisms for reducing the dependency on chemical fertilizers.

□□Advances in microbial strains and delivery systems will continue to improve the efficacy and simplicity of products in their application, thereby boosting the market.

□□The global adoption of rhizobium biofertilizers is expected to rise due to supportive government policies, subsidies, and awareness programs.

Key Players Landscape and Outlook

The major players in the rhizobium biofertilizers market are, however, focusing on innovating and developing products as well as globalizing their operations to address the increasing demand for effective sustainable agricultural solutions. Many companies are investing heavily in research and development to improve their knowledge of the effectiveness of rhizobium for particular crops, soils, and climatic conditions. These companies also employ advanced biotechnological techniques to improve the stability and shelf-life of biofertilizers so that they can be made accessible to farmers worldwide.

The market forecast is positive, with a growing momentum of organic farming promotion through government incentives and an increased consciousness for the conservation of the environment. Partnerships between private companies, agricultural research institutions, and government bodies will catalyze innovation and facilitate penetration into the market. Where precision agriculture and regenerative farming techniques are developing, rhizobium based biofertilizers will become closely integrated into modern farming systems. Although competition is increasingly fierce among players, more general market growth is anticipated over the next few years in emerging economies. New avenues in the promising future of the rhizobium biofertilizer market seem to form even more in developed and developing regions.

Table of Contents:

1. □Project Scope and Definitions
2. □Research Methodology
3. □Executive Summary
4. □Voice of Customer
 - 4.1. □Demographics (Income - Low, Mid and High; Geography; Nationality; etc.)
 - 4.2. □Market Awareness and Product Information
 - 4.3. □Brand Awareness and Loyalty
 - 4.4. □Factors Considered in Purchase Decision
 - 4.4.1. □Effectiveness

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- 4.4.2.□Compatibility
- 4.4.3.□Cost
- 4.4.4.□Return on Investment
- 4.4.5.□Product Quality
- 4.4.6.□Shelf Life
- 4.4.7.□Ease of Application
- 4.4.8.□Environmental and Safety Considerations
- 4.4.9.□Regulatory Compliance and Certification
- 4.4.10.□Brand Reputation
- 4.4.11.□Customer Support
- 4.5.□Purchase Channel
- 4.6.□Frequency of Purchase
- 4.7.□Existing or Intended User
- 5.□Global Rhizobium Biofertilizer Market Outlook, 2018-2032F
- 5.1.□Market Size Analysis & Forecast
- 5.1.1.□By Value
- 5.2.□Market Share Analysis & Forecast
- 5.2.1.□By Formulation
- 5.2.1.1.□Liquid
- 5.2.1.2.□Solid
- 5.2.2.□By Crop Type
- 5.2.2.1.□Cereals and Grains
- 5.2.2.2.□Pulses and Oilseeds
- 5.2.2.3.□Fruits and Vegetables
- 5.2.2.4.□Others
- 5.2.3.□By Application
- 5.2.3.1.□Seed Treatment
- 5.2.3.2.□Soil Treatment
- 5.2.4.□By End-user
- 5.2.4.1.□Residential
- 5.2.4.2.□Commercial
- 5.2.5.□By Region
- 5.2.5.1.□North America
- 5.2.5.2.□Europe
- 5.2.5.3.□Asia-Pacific
- 5.2.5.4.□South America
- 5.2.5.5.□Middle East and Africa
- 5.2.6.□By Company Market Share Analysis (Top 5 Companies and Others - By Value, 2024)
- 5.3.□Market Map Analysis, 2024
- 5.3.1.□By Formulation
- 5.3.2.□By Crop Type
- 5.3.3.□By Application
- 5.3.4.□By End-user
- 5.3.5.□By Region
- 6.□North America Rhizobium Biofertilizer Market Outlook, 2018-2032F*
- 6.1.□Market Size Analysis & Forecast
- 6.1.1.□By Value

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- 6.2. Market Share Analysis & Forecast
 - 6.2.1. By Formulation
 - 6.2.1.1. Liquid
 - 6.2.1.2. Solid
 - 6.2.2. By Crop Type
 - 6.2.2.1. Cereals and Grains
 - 6.2.2.2. Pulses and Oilseeds
 - 6.2.2.3. Fruits and Vegetables
 - 6.2.2.4. Others
 - 6.2.3. By Application
 - 6.2.3.1. Seed Treatment
 - 6.2.3.2. Soil Treatment
 - 6.2.4. By End-user
 - 6.2.4.1. Residential
 - 6.2.4.2. Commercial
 - 6.2.5. By Country Share
 - 6.2.5.1. United States
 - 6.2.5.2. Canada
 - 6.2.5.3. Mexico
 - 6.3. Country Market Assessment
 - 6.3.1. United States Rhizobium Biofertilizer Market Outlook, 2018-2032F*
 - 6.3.1.1. Market Size Analysis & Forecast
 - 6.3.1.1.1. By Value
 - 6.3.1.2. Market Share Analysis & Forecast
 - 6.3.1.2.1. By Formulation
 - 6.3.1.2.1.1. Liquid
 - 6.3.1.2.1.2. Solid
 - 6.3.1.2.2. By Crop Type
 - 6.3.1.2.2.1. Cereals and Grains
 - 6.3.1.2.2.2. Pulses and Oilseeds
 - 6.3.1.2.2.3. Fruits and Vegetables
 - 6.3.1.2.2.4. Others
 - 6.3.1.2.3. By Application
 - 6.3.1.2.3.1. Seed Treatment
 - 6.3.1.2.3.2. Soil Treatment
 - 6.3.1.2.4. By End-user
 - 6.3.1.2.4.1. Residential
 - 6.3.1.2.4.2. Commercial
 - 6.3.2. Canada
 - 6.3.3. Mexico
- *All segments will be provided for all regions and countries covered
- 7. Europe Rhizobium Biofertilizer Market Outlook, 2018-2032F
 - 7.1. Germany
 - 7.2. France
 - 7.3. Italy
 - 7.4. United Kingdom
 - 7.5. Russia

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- 7.6. Netherlands
- 7.7. Spain
- 7.8. Turkey
- 7.9. Poland
- 8. Asia-Pacific Rhizobium Biofertilizer Market Outlook, 2018-2032F
 - 8.1. India
 - 8.2. China
 - 8.3. Japan
 - 8.4. Australia
 - 8.5. Vietnam
 - 8.6. South Korea
 - 8.7. Indonesia
 - 8.8. Philippines
- 9. South America Rhizobium Biofertilizer Market Outlook, 2018-2032F
 - 9.1. Brazil
 - 9.2. Argentina
- 10. Middle East and Africa Rhizobium Biofertilizer Market Outlook, 2018-2032F
 - 10.1. Saudi Arabia
 - 10.2. UAE
 - 10.3. South Africa
- 11. Regulatory Landscape
- 12. Demand Supply Analysis
- 13. Value Chain Analysis
- 14. Porter's Five Forces Analysis
- 15. PESTLE Analysis
- 16. Macro-economic Indicators
- 17. Pricing Analysis
- 18. Market Dynamics
 - 18.1. Market Drivers
 - 18.2. Market Challenges
- 19. Market Trends and Developments
- 20. Case Studies
- 21. Competitive Landscape
 - 21.1. Competition Matrix of Top 5 Market Leaders
 - 21.2. Company Ecosystem Analysis (Startup v/s SME v/s Large-scale)
 - 21.3. SWOT Analysis for Top 5 Players
 - 21.4. Key Players Landscape for Top 10 Market Players
 - 21.4.1. Lallemand Inc.
 - 21.4.1.1. Company Details
 - 21.4.1.2. Key Management Personnel
 - 21.4.1.3. Products and Services
 - 21.4.1.4. Financials (As Reported)
 - 21.4.1.5. Key Market Focus and Geographical Presence
 - 21.4.1.6. Recent Developments/Collaborations/Partnerships/Mergers and Acquisition
 - 21.4.2. Novozymes A/S
 - 21.4.3. Rizobacter Argentina S.A.
 - 21.4.4. Indian Farmers Fertiliser Cooperative Limited

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21.4.5. □IPL Biologicals Limited

21.4.6. □Gujarat State Fertilizers & Chemicals Limited

21.4.7. □Kiwa Bio-Tech Products Group Corporation

21.4.8. □American Vanguard Corporation

21.4.9. □Ficosterra, S.L.

21.4.10. □Bionema Group Limited

*Companies mentioned above DO NOT hold any order as per market share and can be changed as per information available during research work.

22. □Strategic Recommendations

23. □About Us and Disclaimer

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