



“A Study On Growth Potential For Biomass Utilisation In The Indian Biotechnology Industry”

Ashish Patel, Gaurav Patel

Abstract

India's biotechnology industry is expanding quickly, providing social entrepreneurs with numerous chances to tackle important social issues and promote economic development. This study examines the changing biotech landscape in India with an emphasis on opportunities for expansion, sources of funding, public awareness campaigns, and the influence of social entrepreneurship. The study highlights professional consensus about the potential growth of the biotechnology sector by identifying emerging trends based on a thorough review of the literature. It also looks into the various funding options that are available to support biotechnology research and development efforts, highlighting their significance in fostering innovation. In addition, the study looks at how current social entrepreneurship initiatives in the biotech sector are affecting society and the environment, highlighting successful business strategies and models that have improved environmental sustainability and societal well-being. These successful initiatives provide important benchmarks for the field's future growth and development. All things considered, this study sheds light on the complex dynamics of the Indian biotechnology scene and offers social entrepreneurs a road map for overcoming obstacles, seizing opportunities, and promoting constructive change within the sector.

Keywords: Biotechnology industry, Biomass utilization, Entrepreneurial opportunities, Growth potential, Social entrepreneurship, Funding sources, Public awareness, Biotech landscape in India, trends, Funding, Environmental sustainability

Introduction

Innovation, entrepreneurship, and sustainable development initiatives are driving significant growth in India's biotechnology industry. Biomass utilisation is a promising frontier, with opportunities for economic growth and entrepreneurial ventures. As the world faces environmental challenges, the convergence of biotechnology and biomass utilisation provides India with the opportunity to lead the global bioeconomy.

“The global biotechnology market was valued at USD 1.55 trillion in 2023 and is projected to grow at a compound annual growth rate (CAGR) of 13.96% from 2024 to 2030”- (Biotechnology Market Size, Share & Growth Report, 2030, Grand view research). “The global biomass market is expected to grow at a CAGR

of 6.3% between 2021 and 2030.”- (Quince Market Insights). “India is one of the top 12 biotech destinations in the world, ranking third in Asia.” - (National biotechnology development strategy (2021-2025)). “The Indian biotechnology industry was valued at USD 63 billion in FY2019-20 and is expected to reach USD 150 billion by FY25, with over 3500 start-ups expected to grow to 10,000 by 2024-25.”- (National biotechnology development strategy (2021-2025)). “This research looks into how biotechnology can be used to recycle construction waste. It focuses on important developments such as microbial concrete, biodegradable building materials, and the use of sustainable construction methods.”-(Lee, S., Kim, J., & Park, H., 2017). “The Indian biotechnology industry is regulated by four ministries and their agencies, each with specialized agencies. However, application policies can be tedious, discourage investors, and delay approval rates and application tracking.”- (Kapoor, A., & Joshi, T., 2019). “This review paper investigates biomass utilisation for bioenergy, biofuel, bioproducts, and biochar, with a focus on cropping systems, genetic manipulation, and the phytomicrobiome for a sustainable bioeconomy.”- (Antar, M.S., Lyu, D., et al, 2021). “Important Biotechnology Entrepreneurial characteristics include being aware of unknowns, having a multidisciplinary understanding of business and science language, and navigating the complexities of scientific and business decisions”- (Shimasaki, Craig, 2020).

2. Literature review

Lee, Y. S., Kim, H. J., & Park, W. (2017) The study looks into the use of biotechnology to recycle construction waste, with a focus on microbial concrete, biodegradable building materials, and sustainable construction methods. It implies that biotechnological solutions can promote environmentally friendly waste management, encourage the use of environmentally friendly products, and eventually lead to a more sustainable and greener approach in the construction industry.

Kapoor, A., & Joshi, T. (2019) India's biotechnology sector, accounting for 3% of the global market in 2017, is expected to reach \$128 billion by 2025, with the international market estimated at \$390 billion and expanding at a 7.4% annual rate. The worldwide market, assuming the same growth rate, is expected to reach \$670.9 billion.

Mittal, S., Ahlgren, E. O., & Shukla, P. R. (2019) A study in India predicts a biogas potential of 310-655 billion m³/year by 2040, accounting for over 36% of India's total primary energy production in 2015, highlighting the potential of biogas as a sustainable energy source amid rising waste generation.

Kumar, Rabindra & Razdan, Sumeer. (2022) The review emphasises the need for bio-based and biodegradable alternatives to traditional plastics, as well as the importance of clean, environmentally friendly raw materials. It discusses the effects of conventional plastics, the search for biodegradable bioplastics, development challenges, and potential future environmental benefits.

National Biotechnology Development Strategy (2020-2025) The DBT established the Biotechnology Industry Research Assistance Council (BIRAC) to promote biotech research and development. Over the past eight

years, it has supported 1,102 entrepreneurs, 10,000 skilled workers, 150 industry partnerships, and invested Rs. 3529.87 crores in R&D.

Sinha, D., Singh, A., & Kumar, P. (2021). Government funding, startup capital, and a skilled workforce have all contributed significantly to India's biotechnology industry's growth. However, challenges include innovative research, better financial management, investor support, risk assessment, patent protection, and regulatory frameworks. Addressing these issues may help India become a global biotechnology player.

Laura lemetti, et.al. (2022) The study investigates the development of fully biological materials, with a focus on adhesives. Researchers use biomimetic strategies to combine natural components such as silk and cellulose. They develop a water-based adhesive with recombinant spider silk protein that has an excellent strength of 6.7 MPa. This study highlights the significance of engineering proteins for long-lasting, high-performance adhesive systems.

Samir, A., Ashour, F.H., Hakim, A.A., & Bassyouni, M. (2022) Biodegradable polymers are rapidly gaining popularity, with a massive global market worth billions of dollars per year. Their uses include food packaging, computer keyboards, auto interior parts, and medical devices such as implanted devices and medical delivery.

Mateu-Sanz, Miguel et al. (2023), Biocompatibility data generated during biomaterial design and evaluation is extensive, diverse, and complex. Evaluating these data is difficult due to quality differences, associations with qualitative and quantitative data, and multiple experimental outputs.

Muzafar, Malik. (2020), Biotechnology is rapidly evolving to address environmental challenges such as food, renewable materials, and bioremediation. It provides sustainable methods for efficient protocols, clean processes, and products with low environmental impact. Environmental biotechnology balances technical and financial issues in manufacturing, monitoring, and waste management, resulting in lower negative environmental impacts and greater sustainability. Policymakers and industry should evaluate the implications, opportunities, and challenges of modern biotechnology.

Shimasaki, Craig. (2020) Biotechnology entrepreneurs require specific skills to succeed in this sector, as developing a biotechnology product requires a diverse set of disciplines, high costs, and a lengthy time frame. These skills enable leaders to achieve outstanding business results. New leaders frequently struggle to understand the unknown, become multidisciplinary translators, and navigate the complexities of scientific and business decisions. These characteristics are essential for entrepreneurs seeking success in the biotechnology industry.

Usman, Ibrahim Muntaqa Tijjani, et al. (2022) Since the Stone Age, humans have used biomass as a source of energy. Despite less than a century of development, researchers are still investigating the potential applications of biomass-derived bioproducts. Previous studies concentrated on pretreatment, quality improvement, and system design integration.

3. Research Methodology

3.1 Research Design

The research Design For this Study Was a Survey. The research design with Online survey and include questions about Biotechnology related industry growth and opportunities, fundings, awareness etc.,

3.2 Sample

For collecting a samples we create Questionnaire and sent to Many students and other peoples. However, only 278 persons have answered. A structured questionnaire with 17 questions based on biotechnology industry and biomass recycled regarding materials.

3.3 Population

Students from colleges and experts from various backgrounds, age groups, educational levels, socioeconomic statuses, and residential places are asked to complete a research survey for this study.

3.4 Data collection

An online survey served as the method for gathering data for this investigation. The researcher created the survey, which was based on the literature. To make sure the survey questions were understandable and straightforward, a sample of respondents participated in a pilot test.

3.5 Hypothesis

H0: There is a strong correlation between societal acceptability and the strategies employed by social entrepreneurs to raise public awareness and acceptance of biotechnology and its ethical implications.

H1: The strategies employed by social entrepreneurs to inform the public about biotechnology and its moral implications do not significantly correlate with societal acceptability.

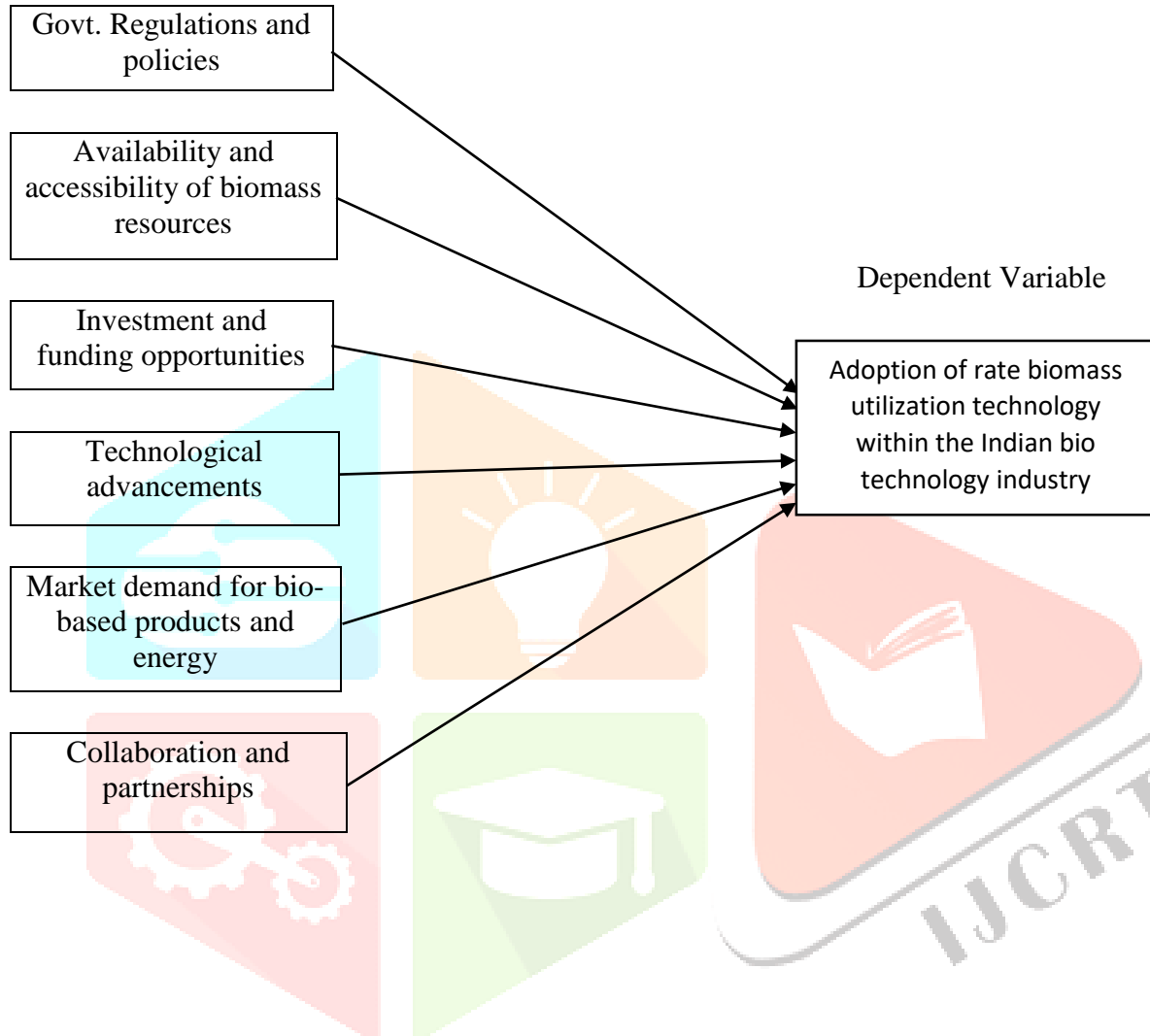
H0: The Indian biotech industry presents clear growth prospects for social entrepreneurs, with certain regions and sectors like medicine, agriculture, environmental sustainability, and education having a significant impact on these opportunities.

H1: Education, healthcare, agriculture, environmental sustainability, and other specific sectors have little bearing on the growth prospects for social entrepreneurs in the Indian biotech sector.

H0: The viability and accessibility of the funding options available to social entrepreneurs in the biotech sector vary greatly, with certain channels being more beneficial than others.

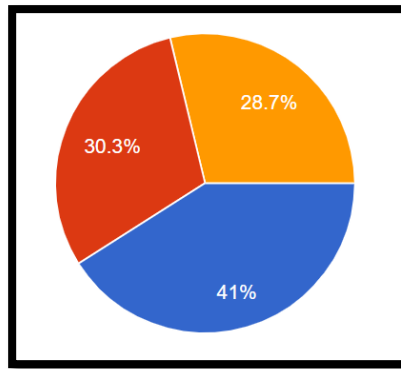
H1: Government grants, impact investments, and venture capital are among the funding options that social entrepreneurs in the biotech sector have access to. These options are comparable in terms of viability and accessibility.

Independent Variable



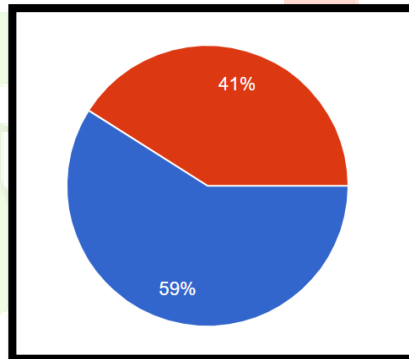
Data analysis and Interpretation

1. Does raising public awareness positively impact the perception of the biotechnology industry?



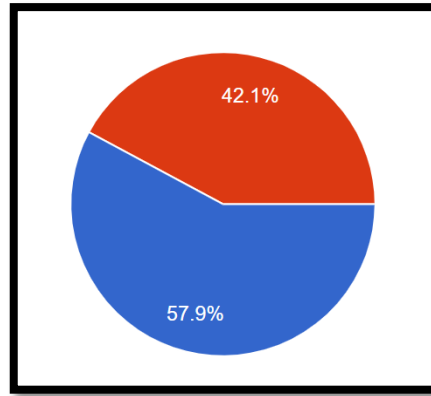
Data	Percentage
Yes	41%
No	30.3%
Maybe	28.7%
Total	100%

2. Are there emerging trends in biotechnology that present growth opportunities?



Data	Percentage
Trends and growth opportunities are available	59%
Trends and growth opportunities are not available	41%
Total	100%

3. Are there multiple sources of funding available for biotechnology research and development?



Data	Percentage
Yes, multiple sources of funding available	57.9%
No, multiple sources of funding not available	42.1%
Total	100%

Results and Findings

H0 public awareness positively impacts the perception of the biotechnology industry it is truth because of 41% people believes that.

H1 public awareness positively impact the perception of the biotechnology industry it isa false because of 30% peoples believes that.

H0 emerging trends in biotechnology that present growth opportunities people believes so it is truth because of 59% belives that.

H1 emerging trends in biotechnology that present growth opportunities people not believes so it is false because of 41% belives that.

H0 sources of funding available for biotechnology research and development it is truth because 5% people belives that.

H1 sources of funding available for biotechnology research and development it is false because of 42% people belives that.

Conclusion

In this research project Biomass utilization within biotechnology industry we found that there are many growth and opportunities available when we find some some literatures based on that type of related biotechnology research paper. Our main objectives are public awarness, available funding resources for entrepreneurs and growth and opportunities. Based on this objectives for research we found out public is aware

about negative impact on globally right now so they want to accept biobased recycled products so, because of that in future growth and opportunities are available and more funding resources are also increasing because of demand increasing in future.

References

Lee, Y. S., Kim, H. J., & Park, W. (2017). Non-ureolytic calcium carbonate precipitation by *Lysinibacillus* sp. YS11 isolated from the rhizosphere of *Miscanthus sacchariflorus*. *Journal of Microbiology*, 55(6), 440–447.

Kapoor, A., & Joshi, T. (2019). Assessment of Indian Biotechnology Landscape: An International Perspective. 14-15.

Mittal, S., Ahlgren, E. O., & Shukla, P. R. (2019). Future biogas resource potential in India: A bottom-up analysis. *Renewable energy*, 141(2019) 379-389.

Antar, M.S., Lyu, D., Nazari, M., Shah, A., Zhou, X., & Smith, D.L. (2021). Biomass for a sustainable bioeconomy: An overview of world biomass production and utilization. *Renewable & Sustainable Energy Reviews*, 139, 110691.

Kumar, Rabindra & Razdan, Sumeer. (2022). Biodegradable Plastics. *Microbiology*, 187-204.

Draft National Biotechnology Development Strategy 2020-25. Department of biotechnology ministry of science and technology government of india.

Biotechnology Market Size, Share & Trend Analysis by Technology (Nanobiotechnology, DNA Sequencing, Cell-based Assays), by Application (Health, Bioinformatics), by Region, and Segment Forecasts, 2024 - 2030, 2023)

Global Biomass Market is Expected to Grow at a CAGR of 6.3% from 2021 to 2030; Quince Market Insights.

Sinha, D., Singh, A., & Kumar, P. (2021). Introduction to Bioentrepreneurship, Bioentrepreneurship and Transferring Technology into Product Development ,1-21.

Laura Lemetti, Jennifer Tersteegen, Juuso Sammaljärvi, A. Sesilja Aranko, and Markus B. Linder (2022) *ACS Sustainable Chemistry & Engineering* 10 (1), 552-561.

Samir, A., Ashour, F.H., Hakim, A.A., & Bassyouni, M. (2022). Recent advances in biodegradable polymers for sustainable applications. *npj Materials Degradation*, 6, 1-28.

Mateu-Sanz, Miguel et al. (2023) “Redefining biomaterial biocompatibility: challenges for artificial intelligence and text mining.” Trends in biotechnology.

Muzafar, Malik. (2020). Environmental Biotechnology: For Sustainable Future. Bioremediation and Biotechnology, 2, 241-258.

Shimasaki, Craig. (2020). What is Biotechnology Entrepreneurship?. Biotechnology Entrepreneurship, 3-16.

Usman, Ibrahim Muntaqa Tijjani, et al. (2022). A comprehensive review on the advances of bioproducts from biomass towards meeting net zero carbon emissions (NZCE). Bioresource Technology, 366.

