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BIOGAS MARKETING STRATEGIES IN INDIA: ACCELERATING THE TRANSITION TOWARDS SDG 7

Prabha Kumari[1] and Dr. Priyanka Dixit[2]

[1]Research Scholar
P.G. Department of Commerce
B.R.A. Bihar University, Muzaffarpur

[2]Head of the Department
P.G. Department of Commerce
Ram Dayalu Singh College
B.R.A. Bihar University, Muzaffarpur

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ABSTRACT

Biogas has emerged as a promising renewable energy option for addressing energy poverty, environmental degradation, and rural development challenges. In alignment with Sustainable Development Goal 7 (SDG 7), which calls for universal access to affordable, reliable, sustainable, and modern energy, biogas holds significant potential in India due to the country's agrarian economy, large livestock base, and abundant organic waste. Despite its technical viability and socio-economic benefits, adoption levels remain below expectations, largely due to limited awareness, inadequate financing mechanisms, and weak marketing approaches. This paper explores the marketing of biogas in India, with particular attention to strategies that emphasize economic, health, environmental, and social benefits. By drawing upon national initiatives such as the National Biogas and Manure Management Programme (NBMMP) and community-based dissemination models, the study identifies critical gaps in outreach and consumer engagement. A SWOT analysis is presented to examine the strengths, weaknesses, opportunities, and threats of biogas marketing in India. The findings underscore the need for integrated marketing approaches that combine policy support, financial innovation, and grassroots-level awareness campaigns. The study concludes with policy and business recommendations to scale biogas adoption, positioning it as a sustainable and market-driven solution to achieve SDG 7 in India.

KEYWORDS: Biogas, SDG 7, Renewable Energy Marketing, Rural India, Sustainable Development, Energy Access

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INTRODUCTION

Ensuring universal access to clean and affordable energy is a cornerstone of sustainable development. The United Nations' Sustainable Development Goal 7 (SDG 7) emphasizes the need for reliable, affordable, sustainable, and modern energy for all by 2030. While India has made significant progress in expanding electricity access, a substantial proportion of rural households continues to rely on firewood, dung cakes, and kerosene for cooking and heating. These traditional fuels contribute to indoor air pollution, deforestation, and greenhouse gas emissions, while also imposing a disproportionate burden on women and children who are primarily responsible for fuel collection and cooking. Biogas, generated through the anaerobic digestion of organic waste, offers an effective alternative to conventional fuels. Its adoption has the potential to address multiple challenges simultaneously: reducing household energy costs, improving health outcomes by minimizing smoke exposure, providing organic fertilizer for agriculture, and lowering carbon emissions. Given India's extensive livestock population and agricultural base, the country possesses one of the largest biogas potentials in the world. Despite this promise, the diffusion of biogas technology in India has not kept pace with expectations. Government initiatives, such as the National Biogas and Manure Management Programme (NBMMP), have played a key role in promoting biogas plants, yet widespread adoption remains limited. A major challenge lies in the way biogas is marketed to potential users. Traditional approaches have emphasized subsidies and technical demonstrations, but they often fail to capture the holistic benefits of biogas that align with household priorities such as health, convenience, and economic savings. This paper examines the role of marketing in advancing biogas adoption in India. It explores how innovative marketing strategies—integrating economic, environmental, health, and social narratives—can enhance user acceptance and scale up biogas deployment. By focusing on India as a case study, the paper aims to provide insights into how biogas can be repositioned not merely as a government-supported technology but as a desirable, market-driven solution that directly contributes to achieving SDG 7.

2.0 REVIEW OF LITERATURE

2.1 Biogas and Sustainable Development

Biogas has been widely recognized as a clean, renewable, and decentralized source of energy that supports sustainable development. According to the International Energy Agency (IEA, 2023), biogas can significantly contribute to reducing dependence on fossil fuels while simultaneously improving rural livelihoods. The United Nations (2015) identifies biogas as a critical technology for achieving **Sustainable Development Goal 7 (SDG 7),** which emphasizes universal access to affordable, reliable, sustainable, and modern energy. Beyond energy, biogas also contributes to **SDG 3 (Good Health and Well-being), SDG 13 (Climate Action),** and **SDG 15 (Life on Land)** by reducing indoor air pollution, mitigating greenhouse gas emissions, and promoting sustainable agricultural practices.

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2.2 Biogas Potential in India

India has immense potential for biogas generation due to its large livestock population and availability of agricultural residues. Studies by the Ministry of New and Renewable Energy (MNRE, 2022) estimate that India's biogas potential exceeds **48 billion cubic meters annually**, yet only a fraction of this potential has been tapped. Since the launch of the National Biogas and Manure Management Programme (NBMMP) in 1981, more than five million family-sized biogas plants have been installed, but adoption has often lagged behind targets due to financial, technical, and social barriers (Khandelwal & Mahdi, 2019).

2.3 Marketing Renewable Energy Technologies

The role of **marketing in renewable energy adoption** has been increasingly emphasized in recent scholarship. According to Ottman (2011), green marketing goes beyond selling products—it builds awareness, shifts attitudes, and promotes sustainable lifestyles. Kotler et al. (2019) highlight the relevance of **social marketing** in influencing behaviour change for collective benefits. In the context of biogas, effective marketing requires not only demonstrating cost savings but also communicating **health, environmental, and social advantages t**hat resonate with rural households.

2.4 Adoption Barriers in Biogas Programs

Multiple studies highlight the challenges that limit biogas adoption in India. Mwirigi et al. (2014) note that **high upfront costs** and lack of access to affordable financing deter rural households. Barnes et al. (2018) argue that **low awareness of** health and environmental benefits, combined with **technical issues in plant maintenance,** hampers user confidence. Socio-cultural resistance, particularly in areas with strong traditional cooking practices, also affects acceptance. These findings suggest that technical viability alone is insufficient; targeted **marketing and community engagement** are necessary for scaling adoption.

2.5 Marketing Narratives for Biogas Adoption

Research demonstrates that biogas adoption is most successful when multiple marketing narratives are combined:

- **Economic Benefits:** Reduced fuel expenses and the use of nutrient-rich slurry as organic fertilizer (Singh & Setiawan, 2020).
- **Health Benefits:** Lower incidence of respiratory illnesses due to reduced smoke exposure (WHO, 2022).
- **Environmental Benefits:** Reduced deforestation, carbon emission mitigation, and sustainable waste management (MNRE, 2022).

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- **Social Benefits:** Women's empowerment through reduced drudgery, community cooperation, and improved rural livelihoods (TERI, 2018).

When such benefits are communicated effectively through awareness campaigns, demonstration plants, and community-led initiatives, the adoption of biogas is significantly higher (Urmee, 2014).

2.6 Research Gap

While extensive literature exists on the **technical feasibility** and **policy frameworks** supporting biogas in India, fewer studies analyze how **marketing strategies directly influence user adoption.** Most government programs have focused on subsidies and installations rather than on designing consumer-centered marketing campaigns that highlight health, social, and environmental co-benefits. This study addresses this gap by examining biogas marketing strategies in India and proposing an integrated framework for scaling adoption in alignment with SDG 7.

3. RESEARCH OBJECTIVES AND METHODOLOGY

3.1 Research Objectives

The primary objective of this study is to explore how marketing strategies can enhance the adoption of biogas in India, thereby contributing to the achievement of Sustainable Development Goal 7 (Affordable and Clean Energy). Specifically, the study seeks to:

1. Examine the current status of biogas adoption in India, with reference to national initiatives such as the National Biogas and Manure Management Programme (NBMMP).
2. Identify key challenges in the dissemination and adoption of biogas technology, particularly from a marketing perspective.
3. Analyze the role of marketing narratives—economic, health, environmental, and social—in influencing household and community acceptance of biogas.
4. Conduct a SWOT analysis to evaluate the strengths, weaknesses, opportunities, and threats associated with biogas marketing in India.
5. Recommend strategies and policy measures to improve the marketing and adoption of biogas, positioning it as a sustainable energy solution for rural India.

3.2 Research Methodology

3.2.1 Research Design

The study adopts a qualitative case study design, focusing on India as the primary context. A case study approach is appropriate given the need to understand the interaction between policy frameworks, marketing strategies, and user perceptions in the adoption of biogas technology.

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3.2.2 Data Sources

The research relies on secondary data sources, including:

- Government reports (e.g., Ministry of New and Renewable Energy [MNRE], National Sample Survey reports).
- International databases (International Energy Agency, UN Sustainable Development Goals). Peer-reviewed journal articles, conference papers, and NGO publications.
- Case studies from organizations such as TERI and SELCO Foundation, which have actively promoted biogas adoption in India.

3.2.3 Analytical Framework

Descriptive Analysis: Used to present adoption trends, government targets, and the current status of biogas plants in India.

Thematic Analysis: To examine recurring themes in the literature, such as adoption challenges, marketing narratives, and community perceptions.

SWOT Analysis: Conducted to systematically assess the strengths, weaknesses, opportunities, and threats related to biogas marketing in India.

Comparative Insights: Lessons are drawn from successful biogas promotion in other developing countries (e.g., Nepal, Bangladesh, and Kenya) for applicability in the Indian context.

3.2.4 Scope and Limitations

This study focuses exclusively on the marketing dimension of biogas in India and does not evaluate technical performance or detailed economic feasibility at the plant level. The reliance on secondary data may limit the ability to capture real-time user experiences, but it provides a broad, evidence-based understanding of the challenges and opportunities in scaling biogas adoption.

4. CASE STUDY: BIOGAS IN INDIA

4.1 Background

India has been promoting biogas technology since the early 1980s, recognizing its potential to address rural energy shortages, reduce environmental degradation, and improve agricultural productivity. The **National Biogas and Manure Management Programme (NBMMP),** launched in 1981, has been the flagship initiative of the Indian government for scaling biogas adoption. The program focuses on installing family-sized and institutional biogas plants, providing subsidies, technical guidance, and training to households. By 2022, over **5 million family-sized biogas plants** had been installed across India, benefiting approximately 13.5 million households (MNRE, 2022). Despite this progress, adoption remains below the estimated potential of **30 million suitable households**, largely due to high upfront costs, lack of awareness, maintenance challenges, and insufficient marketing strategies.

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4.2 Marketing Strategies in Biogas Promotion

4.2.1 Economic Incentives

Economic incentives, including **subsidies and financial assistance,** have been the cornerstone of biogas promotion in India. Family-sized biogas plants (2–6 cubic meters) are often subsidized by 30–50% of the installation cost. While subsidies make the technology more affordable, studies indicate that economic incentives alone are insufficient to drive widespread adoption (Mwirigi et al., 2014). Households often prioritize short-term convenience over long-term benefits, highlighting the need for **value-based marketing** that communicates cost savings, fertilizer benefits, and income opportunities.

4.2.2 Health and Environmental Narratives

Marketing campaigns increasingly emphasize **health benefits,** such as reduction in indoor air pollution and respiratory diseases, and **environmental benefits**, including reduced deforestation and lower greenhouse gas emissions. For example, TERI's community engagement campaigns in Uttar Pradesh and Bihar highlighted **"smoke-free kitchens" a**s a key selling point, which resonated strongly with women, who are primary users of cooking energy. Similarly, environmental messaging around climate change mitigation has improved community awareness and acceptance.

4.2.3 Social and Community-Based Marketing

Social narratives, particularly women's empowerment and community cooperation, have proven effective in promoting biogas adoption. Self-help groups (SHGs) and local NGOs play a critical role in **peer-to-peer marketing,** providing demonstrations, technical training, and maintenance support. Programs such as the SELCO Foundation's rural biogas initiatives have leveraged **community champions** to increase trust and encourage early adoption.

4.3 Adoption Trends

State	Plant Installed	Household Benefitted(Thousands)	Year
Uttar Pradesh	680	1,850	2020
Bihar	310	850	2020
Rajasthan	420	1,200	2020
Maharashtra	290	800	2020
Total (Top 4)	1,700	4,700	2020

Source: MNRE 2022

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Despite steady growth, adoption is uneven across states. Northern and western states show higher uptake due to better subsidy implementation, active NGO involvement, and higher livestock density. Eastern states like Bihar and Odisha face slower adoption due to limited awareness, technical support gaps, and financial constraints.

4.3.1 Biogas Adoption Trends in India (2023–2025)

- As of August 2025, India has installed approximately 5.1 **million small biogas plants** and **361 medium-scale plants,** collectively contributing to a cumulative off-grid power generation capacity of **11.5 MW.**
- In the fiscal year 2023–24, the Ministry of New and Renewable Energy (MNRE) set an annual target of **46,000 small biogas plants,** with **12,693 plants** installed by the end of the year.
- The biogas market in India was valued at **USD 1.55 billion in 2023** and is projected to reach **USD 2.50 billion by 2030,** growing at a **CAGR of 7.0%.**
- In Delhi, the Ghogha Dairy biogas plant, inaugurated in 2025, processes **100 tonnes of wet waste daily**, producing **4 tonnes of CNG** each day.
- In Chhattisgarh, a **₹100 crore CBG plant** is being established in Bilaspur to process **150 metric tonnes of municipal solid waste daily,** generating **5–10 metric tonnes of CBG,** contributing to job creation and sustainable energy solutions.

Recent data indicates gradual growth in biogas adoption, although it remains below its full potential. Key highlights include:

Parameter	Value 2025
Small biogas plants installed	5.1 million
Medium-scale biogas plants installed	361
Off-grid power generation capacity	11.5 MW
Biogas market value (USD)	1.55 Bn (2023), projected 2.50 Bn by 2030
CAGR of biogas market	7.0%
Annual small biogas plant installation	12,693 (FY 2023–24)

Sources : MNRE, 2024 ; PIB, 2025 ; Finance Yahoo, 2023

While northern and western states, such as Uttar Pradesh and Rajasthan, show higher adoption rates due to better subsidy implementation and NGO participation, eastern states like Bihar and Odisha lag because of limited awareness and financial constraints. Urban initiatives like the Ghogha Dairy plant in Delhi and the Bilaspur CBG plant in Chhattisgarh demonstrate the potential of **medium-scale**

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biogas plants for industrial and municipal applications, highlighting opportunities for economic and employment benefits alongside clean energy generation.

4.4 Challenges in Marketing Biogas

1. **Financial Barriers:** High initial investment and limited access to microfinance restrict adoption among small and marginal farmers.
2. **Awareness Gaps:** Many households remain unaware of the multiple benefits of biogas beyond cooking fuel.
3. **Maintenance Issues:** Poor technical support and lack of trained service providers reduce user confidence.
4. **Cultural Resistance:** Traditional cooking practices and preference for biomass in some regions hinder adoption.
5. **Policy Implementation:** Inconsistent subsidy disbursement and limited local-level outreach reduce the effectiveness of national programs.

4.5 Lessons from Successful Campaigns

- Combining **economic, health, and environmental benefits** in marketing messages increases adoption rates.
- **Community-based promotion,** including demonstrations and peer-to-peer advocacy, builds trust.
- **Women-focused campaigns** improve engagement, as women are key decision-makers in household energy use.
- Partnerships with NGOs and private enterprises enhance technical support, awareness, and financing options.

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4.6 SWOT Analysis of Biogas Marketing in India

Strengths	Weakness
Abundant organic waste and livestock availability.	High upfront costs for households.
Government subsidies and policy support.	Limited awareness of health and environmental benefits.
Co-benefits: health, fertilizer, environmental sustainability.	Maintenance and technical support challenges.
Opportunities	**Threats**
Carbon credits and climate finance integration.	Competing cooking fuels (LPG, kerosene).
Expansion of community-based and women-led campaigns.	Policy inconsistencies and delayed subsidies.
Increasing rural awareness of environmental issues.	Socio-cultural resistance to behavioral change.

This SWOT analysis shows that **effective marketing strategies** must leverage strengths and opportunities while addressing weaknesses and threats, particularly focusing on awareness, finance, and maintenance support.

4.7 Key Marketing Insights:

- Cost savings and organic fertilizer production resonate with farmers.
- Medium-scale plants provide additional income through the sale of compressed biogas (CBG).
- Reduction in indoor air pollution is highly valued by women, increasing household adoption.
- Smoke-free kitchens improve overall family health outcomes.
- Messaging around climate change mitigation and sustainable waste management strengthens community acceptance.
- Carbon credit schemes provide additional incentives for medium-scale plants.
- Women-focused campaigns and self-help groups enhance trust and long-term adoption.
- Community engagement and peer-to-peer marketing are effective in rural settings.

5.0 FINDINGS & SUGGESTIONS

The findings indicate that **marketing plays a central role** in bridging the gap between technical feasibility and widespread adoption of biogas. While subsidies and technical support remain necessary, **value-driven marketing**—emphasizing health, environmental, social, and economic

benefits—has a stronger impact on household decision-making. Urban and medium-scale plants show that biogas is not limited to small rural households; industrial and municipal applications can generate significant energy, reduce waste, and create employment. This suggests that **integrated marketing strategies** targeting different stakeholder groups (rural households, industrial users, municipalities) can accelerate adoption. Furthermore, **community-based approaches,** particularly involving women's groups, NGOs, and local influencers, enhance credibility and overcome cultural resistance. Partnerships between the government, private sector, and civil society organizations are essential to provide financial, technical, and informational support.

5.1 Policy Implications and Recommendations

The findings of this study underscore the need for a comprehensive and innovative marketing framework to accelerate biogas adoption in India. Effective policies should go beyond technical deployment and incorporate behavioral, financial, and socio-cultural dimensions to ensure long-term sustainability.

First, multi-dimensional awareness campaigns are critical to highlight the health benefits of clean cooking, the environmental gains of reduced greenhouse gas emissions, and the economic savings from substituting traditional fuels. Media outreach, local influencers, and demonstration projects can be leveraged to build trust and acceptance among rural households and urban communities alike. Second, financial support mechanisms such as microfinance, subsidies, and low-interest loans should be expanded to make small and medium-scale biogas systems more accessible. Linking financial schemes with self-help groups and rural cooperatives can further ensure inclusivity, particularly for women and marginalized groups. Third, strengthening institutional and private sector engagement is vital. Public–private partnerships (PPPs) can play a decisive role in scaling up infrastructure, ensuring efficient plant installation, and offering reliable after-sales service. Training programs for local technicians, combined with regional service centers, would address persistent challenges of maintenance and technical support. Fourth, the promotion of women-led biogas initiatives should be a policy priority. By positioning women as entrepreneurs and community ambassadors, the government can create a multiplier effect in adoption, while simultaneously advancing gender empowerment and inclusive development. Fifth, Integration with broader environmental programs—such as municipal solid waste management and carbon credit markets—will enhance the economic viability of medium- and large-scale plants. These linkages can provide additional revenue streams, attract private investment, and align biogas adoption with India's commitments under the Paris Agreement.

Finally, biogas should be strategically framed as a pillar of India's clean energy transition. By embedding biogas into the national renewable energy mix alongside solar and wind, India can move

closer to achieving Sustainable Development Goal 7: universal access to affordable, reliable, and sustainable energy.

6.0 CONCLUSION AND POLICY IMPLICATIONS

Biogas has emerged as a **key renewable energy solution** for India, offering multiple benefits: energy access, environmental protection, health improvement, and rural livelihood enhancement. Despite significant progress under programs such as the National Biogas and Manure Management Programme (NBMMP), adoption remains below potential due to financial, technical, and socio-cultural barriers. This study highlights the critical role **of marketing strategies** in increasing biogas adoption. Economic incentives, while important, are insufficient without **value-driven messaging** that communicates health, environmental, and social co-benefits. Community-based approaches, women-led campaigns, and partnerships with NGOs and the private sector enhance awareness, trust, and sustained use of biogas technology. The integration of recent data reveals a growing market: India has over **5.1 million small biogas plants** and is witnessing medium-scale plant development in urban and municipal settings. The biogas market is projected to reach **USD 2.50 billion by 2030,** demonstrating strong potential for energy transition, job creation, and climate mitigation.

In conclusion, biogas is not merely a technological intervention; it is a **market-driven solution** with the potential to advance SDG 7 in India. Effective marketing, supported by policy incentives and community engagement, can scale adoption, create sustainable livelihoods, and contribute to India's broader energy and climate goals.

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