



**PALGRAVE ADVANCES IN BIOECONOMY:
ECONOMICS AND POLICIES**

SERIES EDITOR: JUSTUS WESSELER

Advanced Biofuels and Circular Economy

Technoeconomic,
Socioeconomic, and
Environmental
Implications

Edited by
Rahil Akhtar Usmani
Mudasir A. Dar
Akram Ahmad Khan

palgrave
macmillan

Rahil Akhtar Usmani
Mudasir A. Dar • Akram Ahmad Khan
Editors

Advanced Biofuels and Circular Economy

Technoeconomic, Socioeconomic,
and Environmental Implications

palgrave
macmillan

Editors

Rahil Akhtar Usmani
Department of Agriculture, Integral
Institute of Agricultural Science &
Technology (IIAST)
Integral University
Lucknow, Uttar Pradesh, India

Mudasir A. Dar
Biofuels Institute, School of
Environment and Safety Engineering
Jiangsu University
Zhenjiang, Jiangsu, China

Department of Agricultural Economics
and Business Management
Aligarh Muslim University
Aligarh, Uttar Pradesh, India

Akram Ahmad Khan
Department of Agricultural Economics
& Business Management
Aligarh Muslim University
Aligarh, Uttar Pradesh, India

ISSN 2524-5848

ISSN 2524-5856 (electronic)

Palgrave Advances in Bioeconomy: Economics and Policies

ISBN 978-3-031-86933-4

ISBN 978-3-031-86934-1 (eBook)

<https://doi.org/10.1007/978-3-031-86934-1>

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2025

This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use. The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Palgrave Macmillan imprint is published by the registered company Springer Nature Switzerland AG.

The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

If disposing of this product, please recycle the paper.

CONTENTS

- 1 A Perspective on the Circular Economy of Advanced Biofuels** 1
Rahil Akhtar Usmani, Akram Ahmad Khan, Asim Hasan, and Mudasir A. Dar
- 2 Circular Economy Transitions for Advanced Biofuel Supply Chains** 21
Tesfaye Kassaw Bedru, Yohannes Assefa Degaga, Jayakaran Pachiyappan, Selvakumar Periyasamy, and Mani Jayakumar
- 3 Assessing Risks in the Circular Economy of the Advanced Biofuel Industry** 49
Suhail Ahmad Khan and Mohd. Abdul Muqet Maaz
- 4 Circular Economy Advantages Through Derivatives and Value-Added Products in Advanced Biofuel Production** 77
Renan Carriço Payer, Osvaldo Luiz Gonçalves Quelhas, Níssia Carvalho Rosa Bergiante, and João Henrique Paulino Pires Eustachio

5	Exploration of Recent Advancements in Advanced Biofuel Production Technologies	103
	Mahdi Monazzah, Elaheh Kowsari, and Mohammad Sadegh Salmani Kiasari	
6	A Comparative Evaluation of Technoeconomic Feasibility of Advanced Biofuel Production Processes	135
	Akram Avami	
7	Socioeconomic Implications of Advanced Biofuels Production	161
	Mudasir A. Dar, Rongrong Xie, Shehbaz Ali, Rahil Akhtar Usmani, Akram Ahmad Khan, Niknik Nurhayati, Radityo Pangestu, Md Muzammel Hossain, and Jianzhong Sun	
8	Examining Social Dimensions in the Circular Economy of Advanced Biofuel Production	187
	Diego Alexis Ramos Huarachi, Cleiton Hluszko, Micaela Inés Castillo Ulloa, Fabio Neves Puglieri, and Antonio Carlos de Francisco	
9	Sustainable Development and Circular Economy Perspectives on Advanced Biofuels	213
	Muhammad Uzair Javed, Hamid Mukhtar, and Umer Rashid	
10	Advanced Biofuel and Climate Change Mitigation	243
	Mohammad Hasanain, Mehraj Ud Din Sofi, Tarun Tomar, Gaurav Verma, Sandeep Kumar, Vijay Singh Meena, Raghavendra Singh, and Vinod Kumar Singh	
11	Recent Developments in Mapping Environmental Sustainability of Advanced Biofuel	267
	Mudasir A. Dar, Rongrong Xie, Atif Khurshid Wani, I Made Sudiana, Farhan Ahmad, Babbiker Mohammed Taher Gorish, Daochen Zhu, Maryam Gheibipour, Reena Singh, Rahil Akhtar Usmani, Akram Ahmad Khan, and Jianzhong Sun	

12	Overview of Policies for Increasing Advanced Biofuel Utilization in Major Producing Countries	299
	Daniel Balsalobre-Lorente and Syed Ale Raza Shah	
13	Policy and Regulatory Frameworks for Sustainable Production of Advanced Biofuels	333
	Ali Hashemizadeh and Mudasir A. Dar	
14	Prospects and Challenges in Implementing Circular Economy Practices for Advanced Biofuels	361
	Yann Emmanuel Miassi and Kossivi Fabrice Dossa	
15	Potential Routes of Bioenergy Production and Their Circular Bioeconomy	387
	Tesfaye Kassaw Bedru, Wondifraw Abate Abera, Jayakaran Pachiyappan, Selvakumar Periyasamy, and Mani Jayakumar	
16	Methodological Proposal for the Evaluation of the Sustainability of Solid Biofuels	411
	Luis Bernardo López Sosa, Mario Morales-Máximo, Arturo Aguilera Mandujano, Bernardina Alejo Justo, Ricardo González Cárabes, and Netzahualcóyotl Flores Lázaro	
	Index	433



Socioeconomic Implications of Advanced Biofuels Production

*Mudasir A. Dar, Rongrong Xie, Shehbaz Ali,
Rahil Akhtar Usmani, Akram Ahmad Khan,
Niknik Nurhayati, Radityo Pangestu,
Md Muzammel Hossain, and Jianzhong Sun*

7.1 INTRODUCTION

The global energy landscape is undergoing a rapid transformation driven by a variety of factors, including technological innovation, shifts in energy demand, geopolitical tensions, environmental concerns, and the pursuit of sustainability (Dar et al., 2022, 2024). Climate change impacts necessitate

M. A. Dar (✉) • R. Xie • S. Ali • M. M. Hossain • J. Sun (✉)
Biofuels Institute, School of Environment and Safety Engineering, Jiangsu
University, Zhenjiang, Jiangsu, China
e-mail: muddar7@ujs.edu.cn; jzsun1002@ujs.edu.cn

R. Akhtar Usmani
Department of Agriculture, Integral Institute of Agricultural Science &
Technology (IIAST), Integral University, Lucknow, Uttar Pradesh, India
Department of Agricultural Economics and Business Management, Aligarh
Muslim University, Aligarh, Uttar Pradesh, India

© The Author(s), under exclusive license to Springer Nature
Switzerland AG 2025

161

R. Akhtar Usmani et al. (eds.), *Advanced Biofuels and Circular
Economy*, Palgrave Advances in Bioeconomy: Economics and
Policies, https://doi.org/10.1007/978-3-031-86934-1_7