

## Annexures

## References

- [1] Y. Singh, S. Sharma, U. Kumar, P. Sihag, P. Balyan, K.P. Singh, O.P. Dhankher, Strategies for economic utilization of rice straw residues into value-added by-products and prevention of environmental pollution, *Science of The Total Environment* 906 (2024) 167714. <https://doi.org/10.1016/J.SCITOTENV.2023.167714>.
- [2] S.N. Harun, M.M. Hanafiah, N.M. Noor, Rice Straw Utilisation for Bioenergy Production: A Brief Overview, *Energies* 2022, Vol. 15, Page 5542 15 (2022) 5542. <https://doi.org/10.3390/EN15155542>.
- [3] P. Bhattacharyya, J. Bisen, D. Bhaduri, S. Priyadarsini, S. Munda, M. Chakraborti, T. Adak, P. Panneerselvam, A.K. Mukherjee, S.L. Swain, P.K. Dash, S.R. Padhy, A.K. Nayak, H. Pathak, S. Arora, P. Nimbrayan, Turn the wheel from waste to wealth: Economic and environmental gain of sustainable rice straw management practices over field burning in reference to India, *Science of The Total Environment* 775 (2021) 145896. <https://doi.org/10.1016/J.SCITOTENV.2021.145896>.
- [4] H. Qian, X. Zhu, S. Huang, B. Linqvist, Y. Kuzyakov, R. Wassmann, K. Minamikawa, M. Martinez-Eixarch, X. Yan, F. Zhou, B.O. Sander, W. Zhang, Z. Shang, J. Zou, X. Zheng, G. Li, Z. Liu, S. Wang, Y. Ding, K.J. van Groenigen, Y. Jiang, Greenhouse gas emissions and mitigation in rice agriculture, *Nature Reviews Earth & Environment* 2023 4:10 4 (2023) 716–732. <https://doi.org/10.1038/s43017-023-00482-1>.

- [5] R. Singh, M. Srivastava, A. Shukla, Environmental sustainability of bioethanol production from rice straw in India: A review, *Renewable and Sustainable Energy Reviews* 54 (2016) 202–216. <https://doi.org/10.1016/J.RSER.2015.10.005>.
- [6] M.I. Abdurrahman, S. Chaki, G. Saini, Stubble burning: Effects on health & environment, regulations and management practices, *Environmental Advances* 2 (2020) 100011. <https://doi.org/10.1016/J.ENVADV.2020.100011>.
- [7] K. Hayashi, K. Ono, M. Kajiura, S. Sudo, S. Yonemura, A. Fushimi, K. Saitoh, Y. Fujitani, K. Tanabe, Trace gas and particle emissions from open burning of three cereal crop residues: Increase in residue moistness enhances emissions of carbon monoxide, methane, and particulate organic carbon, *Atmos Environ* 95 (2014) 36–44. <https://doi.org/10.1016/J.ATMOSENV.2014.06.023>.
- [8] N.K. Fageria, Role of Soil Organic Matter in Maintaining Sustainability of Cropping Systems, *Commun Soil Sci Plant Anal* 43 (2012) 2063–2113. <https://doi.org/10.1080/00103624.2012.697234>.
- [9] C. Santín, S.H. Doerr, Fire effects on soils: the human dimension, *Philosophical Transactions of the Royal Society B: Biological Sciences* 371 (2016). <https://doi.org/10.1098/RSTB.2015.0171>.
- [10] A.R. Sharma, S.K. Kharol, K.V.S. Badarinath, D. Singh, Impact of agriculture crop residue burning on atmospheric aerosol loading &ndash; a study over Punjab State, India, *Ann Geophys* 28 (2010) 367–379. <https://doi.org/10.5194/ANGEO-28-367-2010>.
- [11] S. Bhuvaneshwari, H. Hettiarachchi, J.N. Meegoda, Crop Residue Burning in India: Policy Challenges and Potential Solutions, *International Journal of*

- Environmental Research and Public Health 2019, Vol. 16, Page 832 16 (2019) 832.  
<https://doi.org/10.3390/IJERPH16050832>.
- [12] S. Mothe, V.R. Polisetty, Review on anaerobic digestion of rice straw for biogas production, *Environmental Science and Pollution Research* 28 (2021) 24455–24469. <https://doi.org/10.1007/S11356-020-08762-9/TABLES/3>.
- [13] G. Rekleitis, K.J. Haralambous, M. Loizidou, K. Aravossis, Utilization of Agricultural and Livestock Waste in Anaerobic Digestion (A.D): Applying the Biorefinery Concept in a Circular Economy, *Energies* 2020, Vol. 13, Page 4428 13 (2020) 4428. <https://doi.org/10.3390/EN13174428>.
- [14] K.L. Kadam, L.H. Forrest, W.A. Jacobson, Rice straw as a lignocellulosic resource: collection, processing, transportation, and environmental aspects, *Biomass Bioenergy* 18 (2000) 369–389. [https://doi.org/10.1016/S0961-9534\(00\)00005-2](https://doi.org/10.1016/S0961-9534(00)00005-2).
- [15] R.A. Dar, M. Parmar, E.A. Dar, R.K. Sani, U.G. Phutela, Biomethanation of agricultural residues: Potential, limitations and possible solutions, *Renewable and Sustainable Energy Reviews* 135 (2021) 110217. <https://doi.org/10.1016/J.RSER.2020.110217>.
- [16] N. Vivek, L.M. Nair, B. Mohan, S.C. Nair, R. Sindhu, A. Pandey, N. Shurpali, P. Binod, Bio-butanol production from rice straw – Recent trends, possibilities, and challenges, *Bioresour Technol Rep* 7 (2019) 100224. <https://doi.org/10.1016/J.BITEB.2019.100224>.
- [17] J. Kainthola, M. Shariq, A.S. Kalamdhad, V. V. Goud, Electrohydrolysis pretreatment methods to enhance the methane production from anaerobic digestion of rice straw using graphite electrode, *Renew Energy* 142 (2019) 1–10. <https://doi.org/10.1016/J.RENENE.2019.04.083>.

- [18] B. Hashemi, S. Sarker, J.J. Lamb, K.M. Lien, Yield improvements in anaerobic digestion of lignocellulosic feedstocks, *J Clean Prod* 288 (2021) 125447. <https://doi.org/10.1016/J.JCLEPRO.2020.125447>.
- [19] E. Shirkavand, S. Baroutian, D.J. Gapes, B.R. Young, Combination of fungal and physicochemical processes for lignocellulosic biomass pretreatment – A review, *Renewable and Sustainable Energy Reviews* 54 (2016) 217–234. <https://doi.org/10.1016/J.RSER.2015.10.003>.
- [20] B.J. Poddar, S.P. Nakhate, R.K. Gupta, A.R. Chavan, A.K. Singh, A.A. Khardenavis, H.J. Purohit, A comprehensive review on the pretreatment of lignocellulosic wastes for improved biogas production by anaerobic digestion, *International Journal of Environmental Science and Technology* 2021 19:4 19 (2021) 3429–3456. <https://doi.org/10.1007/S13762-021-03248-8>.
- [21] R. Singh, S. Kumar, A review on biomethane potential of paddy straw and diverse prospects to enhance its biodigestibility, *J Clean Prod* 217 (2019) 295–307. <https://doi.org/10.1016/J.JCLEPRO.2019.01.207>.
- [22] B. Demirel, P. Scherer, The roles of acetotrophic and hydrogenotrophic methanogens during anaerobic conversion of biomass to methane: A review, *Rev Environ Sci Biotechnol* 7 (2008) 173–190. <https://doi.org/10.1007/S11157-008-9131-1/FIGURES/4>.
- [23] I. Angelidaki, W. Sanders, Assessment of the anaerobic biodegradability of macropollutants, *Rev Environ Sci Biotechnol* 3 (2004) 117–129. <https://doi.org/10.1007/S11157-004-2502-3/METRICS>.

- [24] M. Carballa, L. Regueiro, J.M. Lema, Microbial management of anaerobic digestion: exploiting the microbiome-functionality nexus, *Curr Opin Biotechnol* 33 (2015) 103–111. <https://doi.org/10.1016/J.COPBIO.2015.01.008>.
- [25] T. Silalertruksa, S.H. Gheewala, A comparative LCA of rice straw utilization for fuels and fertilizer in Thailand, *Bioresour Technol* 150 (2013) 412–419. <https://doi.org/10.1016/J.BIORTECH.2013.09.015>.
- [26] J. Zhao, Z. Dong, J. Li, L. Chen, Y. Bai, Y. Jia, T. Shao, Evaluation of *Lactobacillus plantarum* MTD1 and waste molasses as fermentation modifier to increase silage quality and reduce ruminal greenhouse gas emissions of rice straw, *Science of The Total Environment* 688 (2019) 143–152. <https://doi.org/10.1016/J.SCITOTENV.2019.06.236>.
- [27] D. Wang, P. Ai, L. Yu, Z. Tan, Y. Zhang, Comparing the hydrolysis and biogas production performance of alkali and acid pretreatments of rice straw using two-stage anaerobic fermentation, *Biosyst Eng* 132 (2015) 47–55. <https://doi.org/10.1016/J.BIOSYSTEMSENG.2015.02.007>.
- [28] J. Vasco-Correa, S. Khanal, A. Manandhar, A. Shah, Anaerobic digestion for bioenergy production: Global status, environmental and techno-economic implications, and government policies, *Bioresour Technol* 247 (2018) 1015–1026. <https://doi.org/10.1016/J.BIORTECH.2017.09.004>.
- [29] A. Mohammad Rahmani, P. Gahlot, K. Moustakas, A.A. Kazmi, C. Shekhar Prasad Ojha, V.K. Tyagi, Pretreatment methods to enhance solubilization and anaerobic biodegradability of lignocellulosic biomass (wheat straw): Progress and challenges, *Fuel* 319 (2022) 123726. <https://doi.org/10.1016/J.FUEL.2022.123726>.

- [30] A. Jain, S. Sarsaiya, M. Kumar Awasthi, R. Singh, R. Rajput, U.C. Mishra, J. Chen, J. Shi, Bioenergy and bio-products from bio-waste and its associated modern circular economy: Current research trends, challenges, and future outlooks, *Fuel* 307 (2022) 121859. <https://doi.org/10.1016/J.FUEL.2021.121859>.
- [31] P. Purohit, Economic potential of biomass gasification projects under clean development mechanism in India, *J Clean Prod* 17 (2009) 181–193. <https://doi.org/10.1016/J.JCLEPRO.2008.04.004>.
- [32] A. Sharma, G. Singh, S.K. Arya, Biofuel from rice straw, *J Clean Prod* 277 (2020) 124101. <https://doi.org/10.1016/J.JCLEPRO.2020.124101>.
- [33] P. Principi, R. König, M. Cuomo, Anaerobic Digestion of Lignocellulosic Substrates: Benefits of Pre-Treatments, *Current Sustainable/Renewable Energy Reports* 6 (2019) 61–70. <https://doi.org/10.1007/S40518-019-00131-6/METRICS>.
- [34] M. Duque-Acevedo, I. Lancellotti, F. Andreola, L. Barbieri, L.J. Belmonte-Ureña, F. Camacho-Ferre, Management of agricultural waste biomass as raw material for the construction sector: an analysis of sustainable and circular alternatives, *Environ Sci Eur* 34 (2022) 1–23. <https://doi.org/10.1186/S12302-022-00655-7/TABLES/6>.
- [35] M.J. Sukhesh, P.V. Rao, Anaerobic digestion of crop residues: Technological developments and environmental impact in the Indian context, *Biocatal Agric Biotechnol* 16 (2018) 513–528. <https://doi.org/10.1016/J.BCAB.2018.08.007>.
- [36] S. Akbar, S. Ahmed, S. Khan, M. Badshah, Anaerobic Digestate: A Sustainable Source of Bio-fertilizer, *Sustainable Intensification for Agroecosystem Services and Management* (2021) 493–542. [https://doi.org/10.1007/978-981-16-3207-5\\_15/COVER](https://doi.org/10.1007/978-981-16-3207-5_15/COVER).

- [37] Z. Usmani, M. Sharma, A.K. Awasthi, T. Lukk, M.G. Tuohy, L. Gong, P. Nguyen-Tri, A.D. Goddard, R.M. Bill, S.C. Nayak, V.K. Gupta, Lignocellulosic biorefineries: The current state of challenges and strategies for efficient commercialization, *Renewable and Sustainable Energy Reviews* 148 (2021) 111258. <https://doi.org/10.1016/J.RSER.2021.111258>.
- [38] H. Abushammala, J. Mao, A Review on the Partial and Complete Dissolution and Fractionation of Wood and Lignocelluloses Using Imidazolium Ionic Liquids, *Polymers* 2020, Vol. 12, Page 195 12 (2020) 195. <https://doi.org/10.3390/POLYM12010195>.
- [39] J.A. Okolie, A. Mukherjee, S. Nanda, A.K. Dalai, J.A. Kozinski, Next-generation biofuels and platform biochemicals from lignocellulosic biomass, *Int J Energy Res* 45 (2021) 14145–14169. <https://doi.org/10.1002/ER.6697>.
- [40] A. Zoghalmi, G. Paës, Lignocellulosic Biomass: Understanding Recalcitrance and Predicting Hydrolysis, *Front Chem* 7 (2019) 478626. <https://doi.org/10.3389/FCHEM.2019.00874/BIBTEX>.
- [41] S. Haque, R. Singh, D.B. Pal, S. Harakeh, M. Alghanmi, A.D. Teklemariam, T.S. Abujamel, N. Srivastava, V.K. Gupta, Recent Update on anaerobic digestion of paddy straw for biogas production: Advancement, limitation and recommendations, *Environ Res* 215 (2022) 114292. <https://doi.org/10.1016/J.ENVRES.2022.114292>.
- [42] C.Y. Ma, L.H. Xu, Q. Sun, X.J. Shen, J.L. Wen, T.Q. Yuan, Tailored one-pot lignocellulose fractionation to maximize biorefinery toward controllable producing lignin nanoparticles and facilitating enzymatic hydrolysis, *Chemical*

- Engineering Journal 450 (2022) 138315.  
<https://doi.org/10.1016/J.CEJ.2022.138315>.
- [43] J. Dharmaraja, S. Shobana, S. Arvindnarayan, R.R. Francis, R.B. Jeyakumar, R.G. Saratale, V. Ashokkumar, S.K. Bhatia, V. Kumar, G. Kumar, Lignocellulosic biomass conversion via greener pretreatment methods towards biorefinery applications, *Bioresour Technol* 369 (2023) 128328.  
<https://doi.org/10.1016/J.BIORTECH.2022.128328>.
- [44] D.P. Delmer, Y. Amor, Cellulose biosynthesis., *Plant Cell* 7 (1995) 987.  
<https://doi.org/10.1105/TPC.7.7.987>.
- [45] P. McKendry, Energy production from biomass (part 1): overview of biomass, *Bioresour Technol* 83 (2002) 37–46. [https://doi.org/10.1016/S0960-8524\(01\)00118-3](https://doi.org/10.1016/S0960-8524(01)00118-3).
- [46] H. Seddiqi, E. Oliaei, H. Honarkar, J. Jin, L.C. Geonzon, R.G. Bacabac, J. Klein-Nulend, Cellulose and its derivatives: towards biomedical applications, *Cellulose* 2021 28:4 28 (2021) 1893–1931. <https://doi.org/10.1007/S10570-020-03674-W>.
- [47] J. Kainthola, M. Shariq, A.S. Kalamdhad, V. V. Goud, Enhanced methane potential of rice straw with microwave assisted pretreatment and its kinetic analysis, *J Environ Manage* 232 (2019) 188–196.  
<https://doi.org/10.1016/J.JENVMAN.2018.11.052>.
- [48] A.K. Chandel, V.K. Garlapati, A.K. Singh, F.A.F. Antunes, S.S. da Silva, The path forward for lignocellulose biorefineries: Bottlenecks, solutions, and perspective on commercialization, *Bioresour Technol* 264 (2018) 370–381.  
<https://doi.org/10.1016/J.BIORTECH.2018.06.004>.

- [49] X. Pan, N. Gilkes, J.N. Saddler, Effect of acetyl groups on enzymatic hydrolysis of cellulosic substrates, *Holzforschung* 60 (2006) 398–401. <https://doi.org/10.1515/HF.2006.062/MACHINEREADABLECITATION/RIS>.
- [50] A.J. Ragauskas, G.T. Beckham, M.J. Bidy, R. Chandra, F. Chen, M.F. Davis, B.H. Davison, R.A. Dixon, P. Gilna, M. Keller, P. Langan, A.K. Naskar, J.N. Saddler, T.J. Tschaplinski, G.A. Tuskan, C.E. Wyman, Lignin valorization: Improving lignin processing in the biorefinery, *Science* (1979) 344 (2014). [https://doi.org/10.1126/SCIENCE.1246843/ASSET/C0F02F1A-D2FF-4261-946E-BD209F59D829/ASSETS/GRAPHIC/344\\_1246843\\_F5.JPEG](https://doi.org/10.1126/SCIENCE.1246843/ASSET/C0F02F1A-D2FF-4261-946E-BD209F59D829/ASSETS/GRAPHIC/344_1246843_F5.JPEG).
- [51] D. Jackowiak, J.C. Frigon, T. Ribeiro, A. Pauss, S. Guiot, Enhancing solubilisation and methane production kinetic of switchgrass by microwave pretreatment, *Bioresour Technol* 102 (2011) 3535–3540. <https://doi.org/10.1016/J.BIORTECH.2010.11.069>.
- [52] R.W. Whetten, J.J. MacKay, R.R. Sederoff, RECENT ADVANCES IN UNDERSTANDING LIGNIN BIOSYNTHESIS, *Annu Rev Plant Physiol Plant Mol Biol* 49 (1998) 585–609. <https://doi.org/10.1146/ANNUREV.ARPLANT.49.1.585>.
- [53] F.G. Calvo-Flores, J.A. Dobado, Lignin as Renewable Raw Material, *ChemSusChem* 3 (2010) 1227–1235. <https://doi.org/10.1002/CSSC.201000157>.
- [54] J. Kainthola, A.S. Kalamdhad, V. V. Goud, A review on enhanced biogas production from anaerobic digestion of lignocellulosic biomass by different enhancement techniques, *Process Biochemistry* 84 (2019) 81–90. <https://doi.org/10.1016/J.PROCBIO.2019.05.023>.

- [55] M.F.M.A. Zamri, S. Hasmady, A. Akhlar, F. Ideris, A.H. Shamsuddin, M. Mofijur, I.M.R. Fattah, T.M.I. Mahlia, A comprehensive review on anaerobic digestion of organic fraction of municipal solid waste, *Renewable and Sustainable Energy Reviews* 137 (2021) 110637. <https://doi.org/10.1016/J.RSER.2020.110637>.
- [56] P. Merlin Christy, L.R. Gopinath, D. Divya, A review on anaerobic decomposition and enhancement of biogas production through enzymes and microorganisms, *Renewable and Sustainable Energy Reviews* 34 (2014) 167–173. <https://doi.org/10.1016/J.RSER.2014.03.010>.
- [57] S. Wainaina, Lukitawesa, M. Kumar Awasthi, M.J. Taherzadeh, Bioengineering of anaerobic digestion for volatile fatty acids, hydrogen or methane production: A critical review, *Bioengineered* 10 (2019) 437–458. <https://doi.org/10.1080/21655979.2019.1673937>.
- [58] C.O. Onwosi, I.E. Eke, V.C. Igbokwe, J.N. Odimba, J.K. Ndukwe, K.O. Chukwu, G.O. Aliyu, T.N. Nwagu, Towards effective management of digester dysfunction during anaerobic treatment processes, *Renewable and Sustainable Energy Reviews* 116 (2019) 109424. <https://doi.org/10.1016/J.RSER.2019.109424>.
- [59] H. Sträuber, M. Schröder, S. Kleinsteuber, Metabolic and microbial community dynamics during the hydrolytic and acidogenic fermentation in a leach-bed process, *Energy Sustain Soc* 2 (2012) 1–10. <https://doi.org/10.1186/2192-0567-2-13/TABLES/1>.
- [60] L. Wang, Y. Li, X. Yi, F. Yang, D. Wang, H. Han, Dissimilatory manganese reduction facilitates synergistic cooperation of hydrolysis, acidogenesis, acetogenesis and methanogenesis via promoting microbial interaction during

- anaerobic digestion of waste activated sludge, *Environ Res* 218 (2023) 114992.  
<https://doi.org/10.1016/J.ENVRES.2022.114992>.
- [61] X. Pan, L. Zhao, C. Li, I. Angelidaki, N. Lv, J. Ning, G. Cai, G. Zhu, Deep insights into the network of acetate metabolism in anaerobic digestion: focusing on syntrophic acetate oxidation and homoacetogenesis, *Water Res* 190 (2021) 116774.  
<https://doi.org/10.1016/J.WATRES.2020.116774>.
- [62] T.C. D' Silva, A. Isha, R. Chandra, V.K. Vijay, P.M. V. Subbarao, R. Kumar, V.P. Chaudhary, H. Singh, A.A. Khan, V.K. Tyagi, K.L. Kovács, Enhancing methane production in anaerobic digestion through hydrogen assisted pathways – A state-of-the-art review, *Renewable and Sustainable Energy Reviews* 151 (2021) 111536.  
<https://doi.org/10.1016/J.RSER.2021.111536>.
- [63] E. Ryckebosch, M. Drouillon, H. Vervaeren, Techniques for transformation of biogas to biomethane, *Biomass Bioenergy* 35 (2011) 1633–1645.  
<https://doi.org/10.1016/J.BIOMBIOE.2011.02.033>.
- [64] X. Dai, Y. Hua, L. Dai, C. Cai, Particle size reduction of rice straw enhances methane production under anaerobic digestion, *Bioresour Technol* 293 (2019) 122043. <https://doi.org/10.1016/J.BIORTECH.2019.122043>.
- [65] L. Meng, K. Maruo, L. Xie, S. Riya, A. Terada, M. Hosomi, Comparison of leachate percolation and immersion using different inoculation strategies in thermophilic solid-state anaerobic digestion of pig urine and rice straw, *Bioresour Technol* 277 (2019) 216–220. <https://doi.org/10.1016/J.BIORTECH.2019.01.011>.
- [66] S. Sarsaiya, A. Jain, S. Kumar Awasthi, Y. Duan, M. Kumar Awasthi, J. Shi, Microbial dynamics for lignocellulosic waste bioconversion and its importance

- with modern circular economy, challenges and future perspectives, *Bioresour Technol* 291 (2019) 121905. <https://doi.org/10.1016/J.BIORTECH.2019.121905>.
- [67] M. Quintero, L. Castro, C. Ortiz, C. Guzmán, H. Escalante, Enhancement of starting up anaerobic digestion of lignocellulosic substrate: fique's bagasse as an example, *Bioresour Technol* 108 (2012) 8–13. <https://doi.org/10.1016/J.BIORTECH.2011.12.052>.
- [68] R. Kumar, T.H. Kim, B. Basak, S.M. Patil, H.H. Kim, Y. Ahn, K.K. Yadav, M.M.S. Cabral-Pinto, B.H. Jeon, Emerging approaches in lignocellulosic biomass pretreatment and anaerobic bioprocesses for sustainable biofuels production, *J Clean Prod* 333 (2022) 130180. <https://doi.org/10.1016/J.JCLEPRO.2021.130180>.
- [69] J. Shi, F. Xu, Z. Wang, J.A. Stiverson, Z. Yu, Y. Li, Effects of microbial and non-microbial factors of liquid anaerobic digestion effluent as inoculum on solid-state anaerobic digestion of corn stover, *Bioresour Technol* 157 (2014) 188–196. <https://doi.org/10.1016/J.BIORTECH.2014.01.089>.
- [70] H.M. El-Mashad, W.K.P. van Loon, G. Zeeman, G.P.A. Bot, G. Lettinga, Effect of Inoculum Addition Modes and Leachate Recirculation on Anaerobic Digestion of Solid Cattle Manure in an Accumulation System, *Biosyst Eng* 95 (2006) 245–254. <https://doi.org/10.1016/J.BIOSYSTEMSENG.2006.06.006>.
- [71] A. Jeihanipour, C. Niklasson, M.J. Taherzadeh, Enhancement of solubilization rate of cellulose in anaerobic digestion and its drawbacks, *Process Biochemistry* 46 (2011) 1509–1514. <https://doi.org/10.1016/J.PROCBIO.2011.04.003>.
- [72] L. Li, X. Yang, X. Li, M. Zheng, J. Chen, Z. Zhang, The Influence of Inoculum Sources on Anaerobic Biogasification of NaOH-treated Corn Stover, *Energy*

- Sources, Part A: Recovery, Utilization, and Environmental Effects 33 (2010) 138–144. <https://doi.org/10.1080/15567030902937192>.
- [73] L.N. Nguyen, A.Q. Nguyen, M.A.H. Jhir, W. Guo, H.H. Ngo, A. V. Chaves, L.D. Nghiem, Application of rumen and anaerobic sludge microbes for bio harvesting from lignocellulosic biomass, *Chemosphere* 228 (2019) 702–708. <https://doi.org/10.1016/J.CHEMOSPHERE.2019.04.159>.
- [74] J. Moestedt, M. Westerholm, S. Isaksson, A. Schnürer, Inoculum Source Determines Acetate and Lactate Production during Anaerobic Digestion of Sewage Sludge and Food Waste, *Bioengineering* 2020, Vol. 7, Page 3 7 (2019) 3. <https://doi.org/10.3390/BIOENGINEERING7010003>.
- [75] J. Ye, D. Li, Y. Sun, G. Wang, Z. Yuan, F. Zhen, Y. Wang, Improved biogas production from rice straw by co-digestion with kitchen waste and pig manure, *Waste Management* 33 (2013) 2653–2658. <https://doi.org/10.1016/J.WASMAN.2013.05.014>.
- [76] Y. Gu, X. Chen, Z. Liu, X. Zhou, Y. Zhang, Effect of inoculum sources on the anaerobic digestion of rice straw, *Bioresour Technol* 158 (2014) 149–155. <https://doi.org/10.1016/J.BIORTECH.2014.02.011>.
- [77] C. Candia-García, L. Delgadillo-Mirquez, M. Hernandez, Biodegradation of rice straw under anaerobic digestion, *Environ Technol Innov* 10 (2018) 215–222. <https://doi.org/10.1016/J.ETI.2018.02.009>.
- [78] Y. Zhou, C. Li, I.A. Nges, J. Liu, The effects of pre-aeration and inoculation on solid-state anaerobic digestion of rice straw, *Bioresour Technol* 224 (2017) 78–86. <https://doi.org/10.1016/J.BIORTECH.2016.11.104>.

- [79] L. Xin, Z. Guo, X. Xiao, W. Xu, R. Geng, W. Wang, Feasibility of anaerobic digestion for contaminated rice straw inoculated with waste activated sludge, *Bioresour Technol* 266 (2018) 45–50. <https://doi.org/10.1016/J.BIORTECH.2018.06.048>.
- [80] L. Luo, Y. Qu, W. Gong, L. Qin, W. Li, Y. Sun, Effect of Particle Size on the Aerobic and Anaerobic Digestion Characteristics of Whole Rice Straw, *Energies* 2021, Vol. 14, Page 3960 14 (2021) 3960. <https://doi.org/10.3390/EN14133960>.
- [81] J. Kainthola, A.S. Kalamdhad, V. V. Goud, Optimization of process parameters for accelerated methane yield from anaerobic co-digestion of rice straw and food waste, *Renew Energy* 149 (2020) 1352–1359. <https://doi.org/10.1016/J.RENENE.2019.10.124>.
- [82] J. Kainthola, A.S. Kalamdhad, V. V. Goud, Optimization of methane production during anaerobic co-digestion of rice straw and hydrilla verticillata using response surface methodology, *Fuel* 235 (2019) 92–99. <https://doi.org/10.1016/J.FUEL.2018.07.094>.
- [83] F.R. Amin, H. Khalid, W. Li, C. Chen, G. Liu, Enhanced methane production and energy potential from rice straw by employing microaerobic pretreatment via anaerobic digestion, *J Clean Prod* 296 (2021) 126434. <https://doi.org/10.1016/J.JCLEPRO.2021.126434>.
- [84] M.J. Taherzadeh, K. Karimi, Pretreatment of Lignocellulosic Wastes to Improve Ethanol and Biogas Production: A Review, *International Journal of Molecular Sciences* 2008, Vol. 9, Pages 1621-1651 9 (2008) 1621–1651. <https://doi.org/10.3390/IJMS9091621>.

- [85] J. Zhou, B.H. Yan, Y. Wang, X.Y. Yong, Z.H. Yang, H.H. Jia, M. Jiang, P. Wei, Effect of steam explosion pretreatment on the anaerobic digestion of rice straw, *RSC Adv* 6 (2016) 88417–88425. <https://doi.org/10.1039/C6RA15330E>.
- [86] X. Chen, Y.L. Zhang, Y. Gu, Z. Liu, Z. Shen, H. Chu, X. Zhou, Enhancing methane production from rice straw by extrusion pretreatment, *Appl Energy* 122 (2014) 34–41. <https://doi.org/10.1016/J.APENERGY.2014.01.076>.
- [87] X. Qian, G. Shen, Z. Wang, X. Zhang, X. Chen, Z. Tang, Z. Lei, Z. Zhang, Enhancement of high solid anaerobic co-digestion of swine manure with rice straw pretreated by microwave and alkaline, *Bioresour Technol Rep* 7 (2019) 100208. <https://doi.org/10.1016/J.BITEB.2019.100208>.
- [88] T. Luo, H. Huang, Z. Mei, F. Shen, Y. Ge, G. Hu, X. Meng, Hydrothermal pretreatment of rice straw at relatively lower temperature to improve biogas production via anaerobic digestion, *Chinese Chemical Letters* 30 (2019) 1219–1223. <https://doi.org/10.1016/J.CCLET.2019.03.018>.
- [89] J. Yang, X. Lan, T. Zhou, Q. Zhang, Z. Zhang, P. Li, B. Qu, Effects of cold isostatic press pretreatment of rice straw on microstructure and efficiency of anaerobic digestion for methane production, *Bioresour Technol* 386 (2023) 129488. <https://doi.org/10.1016/J.BIORTECH.2023.129488>.
- [90] M. Kim, B.C. Kim, K. Nam, Y. Choi, Effect of pretreatment solutions and conditions on decomposition and anaerobic digestion of lignocellulosic biomass in rice straw, *Biochem Eng J* 140 (2018) 108–114. <https://doi.org/10.1016/J.BEJ.2018.09.012>.

- [91] G. Mancini, S. Papirio, G. Riccardelli, P.N.L. Lens, G. Esposito, Trace elements dosing and alkaline pretreatment in the anaerobic digestion of rice straw, *Bioresour Technol* 247 (2018) 897–903. <https://doi.org/10.1016/J.BIORTECH.2017.10.001>.
- [92] H. Yuan, Y. Zhang, X. Li, Y. Meng, C. Liu, D. Zou, Y. Liu, Effects of Ammoniation Pretreatment at Low Moisture Content on Anaerobic Digestion Performance of Rice Straw, *Bioresources* 9 (2014) 6707–6718. [https://jtatm.textiles.ncsu.edu/index.php/BioRes/article/view/BioRes\\_09\\_4\\_6707\\_Yuan\\_Ammoniation\\_Pretreatment\\_Moisture\\_Rice](https://jtatm.textiles.ncsu.edu/index.php/BioRes/article/view/BioRes_09_4_6707_Yuan_Ammoniation_Pretreatment_Moisture_Rice) (accessed December 9, 2023).
- [93] J. Kainthola, A.S. Kalamdhad, V. V. Goud, R. Goel, Fungal pretreatment and associated kinetics of rice straw hydrolysis to accelerate methane yield from anaerobic digestion, *Bioresour Technol* 286 (2019) 121368. <https://doi.org/10.1016/J.BIORTECH.2019.121368>.
- [94] A.M. Mustafa, T.G. Poulsen, K. Sheng, Fungal pretreatment of rice straw with *Pleurotus ostreatus* and *Trichoderma reesei* to enhance methane production under solid-state anaerobic digestion, *Appl Energy* 180 (2016) 661–671. <https://doi.org/10.1016/J.APENERGY.2016.07.135>.
- [95] R. Guan, X. Li, A.C. Wachemo, H. Yuan, Y. Liu, D. Zou, X. Zuo, J. Gu, Enhancing anaerobic digestion performance and degradation of lignocellulosic components of rice straw by combined biological and chemical pretreatment, *Science of The Total Environment* 637–638 (2018) 9–17. <https://doi.org/10.1016/J.SCITOTENV.2018.04.366>.
- [96] Y. Gu, Y. Zhang, X. Zhou, Effect of  $\text{Ca}(\text{OH})_2$  pretreatment on extruded rice straw anaerobic digestion, *Bioresour Technol* 196 (2015) 116–122. <https://doi.org/10.1016/J.BIORTECH.2015.07.004>.

- [97] Q. Liu, S. Pan, L. Zhou, L. Feng, Z. Li, L. Du, Y. Wei, Improving the Biogas Potential of Rice Straw Through Microwave-Assisted Ammoniation Pretreatment During Anaerobic Digestion, *Bioenergy Res* 15 (2022) 1240–1250. <https://doi.org/10.1007/S12155-021-10299-9/FIGURES/6>.
- [98] A.M. Mustafa, T.G. Poulsen, Y. Xia, K. Sheng, Combinations of fungal and milling pretreatments for enhancing rice straw biogas production during solid-state anaerobic digestion, *Bioresour Technol* 224 (2017) 174–182. <https://doi.org/10.1016/J.BIORTECH.2016.11.028>.
- [99] S. Ahmad, V. V. Pathak, R. Kothari, R.P. Singh, Prospects for pretreatment methods of lignocellulosic waste biomass for biogas enhancement: opportunities and challenges, *Biofuels* 9 (2018) 575–594. <https://doi.org/10.1080/17597269.2017.1378991>.
- [100] A. Duque, P. Manzanares, I. Ballesteros, M.J. Negro, J.M. Oliva, F. Saez, M. Ballesteros, Study of process configuration and catalyst concentration in integrated alkaline extrusion of barley straw for bioethanol production, *Fuel* 134 (2014) 448–454. <https://doi.org/10.1016/J.FUEL.2014.05.084>.
- [101] S. Kumar, T.C. D’Silva, R. Chandra, A. Malik, V.K. Vijay, A. Misra, Strategies for boosting biomethane production from rice straw: A systematic review, *Bioresour Technol Rep* 15 (2021) 100813. <https://doi.org/10.1016/J.BITEB.2021.100813>.
- [102] S. Zhu, Y. Wu, Z. Yu, C. Wang, F. Yu, S. Jin, Y. Ding, R. Chi, J. Liao, Y. Zhang, Comparison of Three Microwave/Chemical Pretreatment Processes for Enzymatic Hydrolysis of Rice Straw, *Biosyst Eng* 93 (2006) 279–283. <https://doi.org/10.1016/J.BIOSYSTEMSENG.2005.11.013>.

- [103] S. Semwal, T. Raj, R. Kumar, J. Christopher, R.P. Gupta, S.K. Puri, R. Kumar, S.S.V. Ramakumar, Process optimization and mass balance studies of pilot scale steam explosion pretreatment of rice straw for higher sugar release, *Biomass Bioenergy* 130 (2019) 105390. <https://doi.org/10.1016/J.BIOMBIOE.2019.105390>.
- [104] R. Chandra, H. Takeuchi, T. Hasegawa, Hydrothermal pretreatment of rice straw biomass: A potential and promising method for enhanced methane production, *Appl Energy* 94 (2012) 129–140. <https://doi.org/10.1016/J.APENERGY.2012.01.027>.
- [105] Y. Zheng, J. Zhao, F. Xu, Y. Li, Pretreatment of lignocellulosic biomass for enhanced biogas production, *Prog Energy Combust Sci* 42 (2014) 35–53. <https://doi.org/10.1016/J.PECS.2014.01.001>.
- [106] Z. You, T. Wei, J.J. Cheng, Improving anaerobic codigestion of corn stover using sodium hydroxide pretreatment, *Energy and Fuels* 28 (2014) 549–554. [https://doi.org/10.1021/EF4016476/ASSET/IMAGES/LARGE/EF-2013-016476\\_0005.JPEG](https://doi.org/10.1021/EF4016476/ASSET/IMAGES/LARGE/EF-2013-016476_0005.JPEG).
- [107] Z. Song, G. Yang, X. Han, Y. Feng, G. Ren, Optimization of the alkaline pretreatment of rice straw for enhanced methane yield, *Biomed Res Int* 2013 (2013). <https://doi.org/10.1155/2013/968692>.
- [108] Y. He, Y. Pang, Y. Liu, X. Li, K. Wang, Physicochemical characterization of rice straw pretreated with sodium hydroxide in the solid state for enhancing biogas production, *Energy and Fuels* 22 (2008) 2775–2781. [https://doi.org/10.1021/EF8000967/ASSET/IMAGES/LARGE/EF-2008-000967\\_0012.JPEG](https://doi.org/10.1021/EF8000967/ASSET/IMAGES/LARGE/EF-2008-000967_0012.JPEG).

- [109] N. Pensupa, S.-Y. Leu, Y. Hu, C. Du, H. Liu, H. Jing, H. Wang, C.S.K. Lin, Recent Trends in Sustainable Textile Waste Recycling Methods: Current Situation and Future Prospects, (2017) 189–228. [https://doi.org/10.1007/978-3-319-90653-9\\_7](https://doi.org/10.1007/978-3-319-90653-9_7).
- [110] Z. lin Song, G. he Yag, Y. zhong Feng, G. xin Ren, X. hui Han, Pretreatment of Rice Straw by Hydrogen Peroxide for Enhanced Methane Yield, *J Integr Agric* 12 (2013) 1258–1266. [https://doi.org/10.1016/S2095-3119\(13\)60355-X](https://doi.org/10.1016/S2095-3119(13)60355-X).
- [111] I. Adorjan, J. Sjöberg, T. Rosenau, A. Hofinger, P. Kosma, Kinetic and chemical studies on the isomerization of monosaccharides in N-methylmorpholine-N-oxide (NMMO) under Lyocell conditions, *Carbohydr Res* 339 (2004) 1899–1906. <https://doi.org/10.1016/J.CARRES.2004.06.004>.
- [112] A. Teghammar, K. Karimi, I. Sárvári Horváth, M.J. Taherzadeh, Enhanced biogas production from rice straw, triticale straw and softwood spruce by NMMO pretreatment, *Biomass Bioenergy* 36 (2012) 116–120. <https://doi.org/10.1016/J.BIOMBIOE.2011.10.019>.
- [113] C. Ding, X. Wang, M. Li, Evaluation of six white-rot fungal pretreatments on corn stover for the production of cellulolytic and ligninolytic enzymes, reducing sugars, and ethanol, *Appl Microbiol Biotechnol* 103 (2019) 5641–5652. <https://doi.org/10.1007/S00253-019-09884-Y/TABLES/2>.
- [114] H. Suryadi, J.J. Judono, M.R. Putri, A.D. Ecclesia, J.M. Ulhaq, D.N. Agustina, T. Sumiati, Bidelignification of lignocellulose using ligninolytic enzymes from white-rot fungi, *Heliyon* 8 (2022) e08865. <https://doi.org/10.1016/J.HELİYON.2022.E08865>.
- [115] U. Brémond, R. de Buyer, J.P. Steyer, N. Bernet, H. Carrere, Biological pretreatments of biomass for improving biogas production: an overview from lab

- scale to full-scale, *Renewable and Sustainable Energy Reviews* 90 (2018) 583–604. <https://doi.org/10.1016/J.RSER.2018.03.103>.
- [116] B. Beig, M. Riaz, S. Raza Naqvi, M. Hassan, Z. Zheng, K. Karimi, A. Pugazhendhi, A.E. Atabani, N. Thuy Lan Chi, Current challenges and innovative developments in pretreatment of lignocellulosic residues for biofuel production: A review, *Fuel* 287 (2021) 119670. <https://doi.org/10.1016/J.FUEL.2020.119670>.
- [117] V.K. Tyagi, S.L. Lo, Application of physico-chemical pretreatment methods to enhance the sludge disintegration and subsequent anaerobic digestion: an up to date review, *Reviews in Environmental Science and Bio/Technology* 2011 10:3 10 (2011) 215–242. <https://doi.org/10.1007/S11157-011-9244-9>.
- [118] Z. Hu, Z. Wen, Enhancing enzymatic digestibility of switchgrass by microwave-assisted alkali pretreatment, *Biochem Eng J* 38 (2008) 369–378. <https://doi.org/10.1016/J.BEJ.2007.08.001>.
- [119] J.U. Hernández-Beltrán, I.O. Hernández-De Lira, M.M. Cruz-Santos, A. Saucedo-Luevanos, F. Hernández-Terán, N. Balagurusamy, Insight into Pretreatment Methods of Lignocellulosic Biomass to Increase Biogas Yield: Current State, Challenges, and Opportunities, *Applied Sciences* 2019, Vol. 9, Page 3721 9 (2019) 3721. <https://doi.org/10.3390/APP9183721>.
- [120] M.U. Khan, M. Usman, M.A. Ashraf, N. Dutta, G. Luo, S. Zhang, A review of recent advancements in pretreatment techniques of lignocellulosic materials for biogas production: Opportunities and Limitations, *Chemical Engineering Journal Advances* 10 (2022) 100263. <https://doi.org/10.1016/J.CEJA.2022.100263>.

- [121] S. Pan, Q. Liu, C. Wen, Z. Li, L. Du, Y. Wei, Producing Biogas from Rice Straw: Kinetic Analysis and Microbial Community Dynamics, *Bioenergy Res* 14 (2021) 1338–1348. <https://doi.org/10.1007/S12155-020-10226-4/FIGURES/5>.
- [122] H. Pasalari, M. Gholami, A. Rezaee, A. Esrafil, M. Farzadkia, Perspectives on microbial community in anaerobic digestion with emphasis on environmental parameters: A systematic review, *Chemosphere* 270 (2021) 128618. <https://doi.org/10.1016/J.CHEMOSPHERE.2020.128618>.
- [123] G.W. Park, C. Seo, K. Jung, H.N. Chang, W. Kim, Y.C. Kim, A comprehensive study on volatile fatty acids production from rice straw coupled with microbial community analysis, *Bioprocess Biosyst Eng* 38 (2015) 1157–1166. <https://doi.org/10.1007/S00449-015-1357-Z/FIGURES/4>.
- [124] M.S.M. Jetten, A.J.M. Stams, A.J.B. Zehnder, Methanogenesis from acetate: a comparison of the acetate metabolism in *Methanotheroxobacter* and *Methanosarcina* spp., *FEMS Microbiol Rev* 8 (1992) 181–197. <https://doi.org/10.1111/J.1574-6968.1992.TB04987.X>.
- [125] A.J.M. Stams, C.M. Plugge, Electron transfer in syntrophic communities of anaerobic bacteria and archaea, *Nature Reviews Microbiology* 2009 7:8 7 (2009) 568–577. <https://doi.org/10.1038/nrmicro2166>.
- [126] L. Blasco, M. Kahala, S. Ervasti, E. Tampio, Dynamics of microbial community in response to co-feedstock composition in anaerobic digestion, *Bioresour Technol* 364 (2022) 128039. <https://doi.org/10.1016/J.BIORTECH.2022.128039>.
- [127] M. Pazda, J. Kumirska, P. Stepnowski, E. Mulkiewicz, Antibiotic resistance genes identified in wastewater treatment plant systems – A review, *Science of The Total*

<https://doi.org/10.1016/J.SCITOTENV.2019.134023>.

- [128] R. Takenaka, Y. Aoi, N. Ozaki, A. Ohashi, T. Kindaichi, Specificities and Efficiencies of Primers Targeting Candidatus Phylum Saccharibacteria in Activated Sludge, *Materials* 2018, Vol. 11, Page 1129 11 (2018) 1129. <https://doi.org/10.3390/MA11071129>.
- [129] Y.G. Zhu, T.A. Johnson, J.Q. Su, M. Qiao, G.X. Guo, R.D. Stedtfeld, S.A. Hashsham, J.M. Tiedje, Diverse and abundant antibiotic resistance genes in Chinese swine farms, *Proc Natl Acad Sci U S A* 110 (2013) 3435–3440. <https://doi.org/10.1073/PNAS.1222743110/-/DCSUPPLEMENTAL>.
- [130] A.K. Wani, N. Akhtar, R. Singh, C. Chopra, P. Kakade, M. Borde, J.M. Al-Khayri, P. Suprasanna, S.B. Zimare, Prospects of advanced metagenomics and meta-omics in the investigation of phytomicrobiome to forecast beneficial and pathogenic response, *Mol Biol Rep* 49 (2022) 12165–12179. <https://doi.org/10.1007/S11033-022-07936-7/TABLES/2>.
- [131] M. Bahram, M. Espenberg, J. Pärn, L. Lehtovirta-Morley, S. Anslan, K. Kasak, U. Kõljalg, J. Liira, M. Maddison, M. Moora, Ü. Niinemets, M. Öpik, M. Pärtel, K. Soosaar, M. Zobel, F. Hildebrand, L. Tedersoo, Ü. Mander, Structure and function of the soil microbiome underlying N<sub>2</sub>O emissions from global wetlands, *Nature Communications* 2022 13:1 13 (2022) 1–10. <https://doi.org/10.1038/s41467-022-29161-3>.
- [132] M. Boolchandani, A.W. D’Souza, G. Dantas, Sequencing-based methods and resources to study antimicrobial resistance, *Nature Reviews Genetics* 2019 20:6 20 (2019) 356–370. <https://doi.org/10.1038/s41576-019-0108-4>.

- [133] E. Garner, B.C. Davis, E. Milligan, M.F. Blair, I. Keenum, A. Maile-Moskowitz, J. Pan, M. Gnegy, K. Liguori, S. Gupta, A.J. Prussin, L.C. Marr, L.S. Heath, P.J. Vikesland, L. Zhang, A. Pruden, Next generation sequencing approaches to evaluate water and wastewater quality, *Water Res* 194 (2021) 116907. <https://doi.org/10.1016/J.WATRES.2021.116907>.
- [134] G. Uritskiy, J. Di Ruggiero, Applying Genome-Resolved Metagenomics to Deconvolute the Halophilic Microbiome, *Genes* 2019, Vol. 10, Page 220 10 (2019) 220. <https://doi.org/10.3390/GENES10030220>.
- [135] Y. Hu, X. Yang, J. Qin, N. Lu, G. Cheng, N. Wu, Y. Pan, J. Li, L. Zhu, X. Wang, Z. Meng, F. Zhao, D. Liu, J. Ma, N. Qin, C. Xiang, Y. Xiao, L. Li, H. Yang, J. Wang, R. Yang, G.F. Gao, J. Wang, B. Zhu, Metagenome-wide analysis of antibiotic resistance genes in a large cohort of human gut microbiota, *Nature Communications* 2013 4:1 4 (2013) 1–7. <https://doi.org/10.1038/ncomms3151>.
- [136] C. Koch, H. Harms, S. Müller, Dynamics in the microbial cytochrome — single cell analytics in natural systems, *Curr Opin Biotechnol* 27 (2014) 134–141. <https://doi.org/10.1016/J.COPBIO.2014.01.011>.
- [137] N. Segata, L. Waldron, A. Ballarini, V. Narasimhan, O. Jousson, C. Huttenhower, Metagenomic microbial community profiling using unique clade-specific marker genes, *Nature Methods* 2012 9:8 9 (2012) 811–814. <https://doi.org/10.1038/nmeth.2066>.
- [138] E.A. McDaniel, F. Moya-Flores, N. Keene Beach, P.Y. Camejo, B.O. Oyserman, M. Kizaric, E.H. Khor, D.R. Noguera, K.D. McMahon, Metabolic Differentiation of Co-occurring *Accumulibacter* Clades Revealed through Genome-Resolved Metatranscriptomics, *MSystems* 6 (2021) 474–495.

[https://doi.org/10.1128/MSYSTEMS.00474-21/SUPPL\\_FILE/MSYSTEMS.00474-21-SF002.TIF](https://doi.org/10.1128/MSYSTEMS.00474-21/SUPPL_FILE/MSYSTEMS.00474-21-SF002.TIF).

- [139] X. Zhang, R. Li, Electrodes bioaugmentation promotes the removal of antibiotics from concentrated sludge in microbial electrolysis cells, *Sci Total Environ* 715 (2020). <https://doi.org/10.1016/J.SCITOTENV.2020.136997>.
- [140] J. Lambrecht, N. Cichocki, T. Hübschmann, C. Koch, H. Harms, S. Müller, Flow cytometric quantification, sorting and sequencing of methanogenic archaea based on F420 autofluorescence, *Microb Cell Fact* 16 (2017) 1–15. <https://doi.org/10.1186/S12934-017-0793-7/FIGURES/6>.
- [141] P. Basinas, J. Rusín, K. Chamrádová, K. Malachová, Z. Rybková, Č. Novotný, Fungal pretreatment parameters for improving methane generation from anaerobic digestion of corn silage, *Bioresour Technol* 345 (2022) 126526. <https://doi.org/10.1016/J.BIORTECH.2021.126526>.
- [142] William.G. Walter, STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER (11th ed.), *Am J Public Health Nations Health* 51 (1961) 940–940. <https://doi.org/10.2105/AJPH.51.6.940-A>.
- [143] H. Xu, Y. Li, D. Hua, Y. Zhao, L. Chen, L. Zhou, G. Chen, Effect of microaerobic microbial pretreatment on anaerobic digestion of a lignocellulosic substrate under controlled pH conditions, *Bioresour Technol* 328 (2021) 124852. <https://doi.org/10.1016/J.BIORTECH.2021.124852>.
- [144] C. Yan, Y. Liu, X. Cui, L. Cao, J. Xiong, Q. Zhang, Y. Wang, R. Ruan, Improving the efficiency of anaerobic digestion: Domesticated paddy soil microbes enhance the hydrolytic acidification of rice straw and pig manure, *Bioresour Technol* 345 (2022) 126570. <https://doi.org/10.1016/J.BIORTECH.2021.126570>.

- [145] S. Fatma, A. Saleem, R. Tabassum, Wheat straw hydrolysis by using co-cultures of *Trichoderma reesei* and *Monascus purpureus* toward enhanced biodegradation of the lignocellulosic biomass in bioethanol biorefinery, *Biomass Convers Biorefin* 11 (2021) 743–754. <https://doi.org/10.1007/S13399-020-00652-X/FIGURES/5>.
- [146] D.S. Arora, P.K. Gill, Comparison of two assay procedures for lignin peroxidase, *Enzyme Microb Technol* 28 (2001) 602–605. [https://doi.org/10.1016/S0141-0229\(01\)00302-7](https://doi.org/10.1016/S0141-0229(01)00302-7).
- [147] H.A.C. Montgomery, J.F. Dymock, N.S. Thom, The rapid colorimetric determination of organic acids and their salts in sewage-sludge liquor, *Analyst* 87 (1962) 949–955. <https://doi.org/10.1039/AN9628700949>.
- [148] S.J. Jung, S.H. Kim, I.M. Chung, Comparison of lignin, cellulose, and hemicellulose contents for biofuels utilization among 4 types of lignocellulosic crops, *Biomass Bioenergy* 83 (2015) 322–327. <https://doi.org/10.1016/J.BIOMBIOE.2015.10.007>.
- [149] H. Rabemanolontsoa, S. Saka, Holocellulose determination in biomass, *Green Energy and Technology* 108 (2012) 135–140. [https://doi.org/10.1007/978-4-431-54067-0\\_14/COVER](https://doi.org/10.1007/978-4-431-54067-0_14/COVER).
- [150] M.W. Bray, T.M. Andrews, An Improved Method for the Determination of Alpha-, Beta-, and Gamma-Cellulose, *Ind Eng Chem* 15 (1923) 377–378. <https://doi.org/10.1021/IE50160A024>.
- [151] A.S. Dhoble, S. Bekal, W. Dolatowski, C. Yanz, K.N. Lambert, K.D. Bhalerao, A novel high-throughput multi-parameter flow cytometry based method for monitoring and rapid characterization of microbiome dynamics in anaerobic

- systems, *Bioresour Technol* 220 (2016) 566–571.  
<https://doi.org/10.1016/J.BIORTECH.2016.08.076>.
- [152] A. Mukhtar, S. Saqib, M. Mubashir, S. Ullah, A. Inayat, A. Mahmood, M. Ibrahim, P.L. Show, Mitigation of CO<sub>2</sub> emissions by transforming to biofuels: Optimization of biofuels production processes, *Renewable and Sustainable Energy Reviews* 150 (2021) 111487. <https://doi.org/10.1016/J.RSER.2021.111487>.
- [153] J. Rani, K.P. Pandey, J. Kushwaha, M. Priyadarsini, A.S. Dhoble, Antibiotics in anaerobic digestion: Investigative studies on digester performance and microbial diversity, *Bioresour Technol* 361 (2022) 127662.  
<https://doi.org/10.1016/J.BIORTECH.2022.127662>.
- [154] D.B. Pal, A.K. Tiwari, A. Mohammad, N. Prasad, N. Srivastava, K.R. Srivastava, R. Singh, T. Yoon, A. Syed, A.H. Bahkali, V.K. Gupta, Enhanced biogas production potential analysis of rice straw: Biomass characterization, kinetics and anaerobic co-digestion investigations, *Bioresour Technol* 358 (2022) 127391.  
<https://doi.org/10.1016/J.BIORTECH.2022.127391>.
- [155] M. Malhotra, K. Aboudi, L. Pisharody, A. Singh, J.R. Banu, S.K. Bhatia, S. Varjani, S. Kumar, C. González-Fernández, S. Kumar, R. Singh, V.K. Tyagi, Biorefinery of anaerobic digestate in a circular bioeconomy: Opportunities, challenges and perspectives, *Renewable and Sustainable Energy Reviews* 166 (2022) 112642.  
<https://doi.org/10.1016/J.RSER.2022.112642>.
- [156] H. Saveyn, P. Eder, End-of-waste criteria for biodegradable waste subjected to biological treatment (compost & digestate): Technical proposals, *JRC Scientific and Policy Reports* (2014). <https://asset-pdf.scinapse.io/prod/1589332136/1589332136.pdf> (accessed March 15, 2023).

- [157] R. Delzeit, U. Kellner, The impact of plant size and location on profitability of biogas plants in Germany under consideration of processing digestates, *Biomass Bioenergy* 52 (2013) 43–53. <https://doi.org/10.1016/J.BIOMBIOE.2013.02.029>.
- [158] Y. Li, Z. Chen, Y. Peng, W. Huang, J. Liu, V. Mironov, S. Zhang, Deeper insights into the effects of substrate to inoculum ratio selection on the relationship of kinetic parameters, microbial communities, and key metabolic pathways during the anaerobic digestion of food waste, *Water Res* 217 (2022) 118440. <https://doi.org/10.1016/J.WATRES.2022.118440>.
- [159] J. Li, Y. Wu, J. Zhao, S. Wang, Z. Dong, T. Shao, Bioaugmented degradation of rice straw combining two novel microbial consortia and lactic acid bacteria for enhancing the methane production, *Bioresour Technol* 344 (2022) 126148. <https://doi.org/10.1016/J.BIORTECH.2021.126148>.
- [160] S. Faisal, N. Thakur, M. Jalalah, F.A. Harraz, M.S. Al-Assiri, I. Saif, G. Ali, Y. Zheng, E.S. Salama, Facilitated lignocellulosic biomass digestibility in anaerobic digestion for biomethane production: microbial communities' structure and interactions, *Journal of Chemical Technology & Biotechnology* 96 (2021) 1798–1817. <https://doi.org/10.1002/JCTB.6747>.
- [161] J. Lee, J.R. Kim, S. Jeong, J. Cho, J.Y. Kim, Long-term performance of anaerobic digestion for crop residues containing heavy metals and response of microbial communities, *Waste Management* 59 (2017) 498–507. <https://doi.org/10.1016/J.WASMAN.2016.10.005>.
- [162] Y. Chen, Z. Zhao, H. Zou, H. Yang, T. Sun, M. Li, H. Chai, L. Li, H. Ai, D. Shi, Q. He, L. Gu, Digestive performance of sludge with different crop straws in

- mesophilic anaerobic digestion, *Bioresour Technol* 289 (2019) 121595.  
<https://doi.org/10.1016/J.BIORTECH.2019.121595>.
- [163] H. Zheng, F. Tang, Y. Lin, Z. Xu, Z. Xie, J. Tian, Solid-state anaerobic digestion of rice straw pretreated with swine manure digested effluent, *J Clean Prod* 348 (2022) 131252. <https://doi.org/10.1016/J.JCLEPRO.2022.131252>.
- [164] H. Yuan, R. Guan, A.C. Wachemo, Y. Zhang, X. Zuo, X. Li, Improving physicochemical characteristics and anaerobic digestion performance of rice straw via ammonia pretreatment at varying concentrations and moisture levels, *Chin J Chem Eng* 28 (2020) 541–547. <https://doi.org/10.1016/J.CJCHE.2019.07.009>.
- [165] S. Xiang, F. Lu, Y. Liu, R. Ruan, Pretreated rice straw improves the biogas production and heavy metals passivation of pig manure containing copper and zinc, *J Clean Prod* 315 (2021) 128171. <https://doi.org/10.1016/J.JCLEPRO.2021.128171>.
- [166] A.S. Fonseca, S. Panthapulakkal, S.K. Konar, M. Sain, L. Bufalino, J. Raabe, I.P.A. Miranda, M.A. Martins, G.H.D. Tonoli, Improving cellulose nanofibrillation of non-wood fiber using alkaline and bleaching pre-treatments, *Ind Crops Prod* 131 (2019) 203–212. <https://doi.org/10.1016/J.INDCROP.2019.01.046>.
- [167] A.M. Ziganshin, J. Liebetrau, J. Pröter, S. Kleinstüber, Microbial community structure and dynamics during anaerobic digestion of various agricultural waste materials, *Appl Microbiol Biotechnol* 97 (2013) 5161–5174. <https://doi.org/10.1007/S00253-013-4867-0/FIGURES/4>.
- [168] Y. Liu, J. Fang, X. Tong, C.C. Huan, G. Ji, Y. Zeng, L. Xu, Z. Yan, Change to biogas production in solid-state anaerobic digestion using rice straw as substrates

- at different temperatures, *Bioresour Technol* 293 (2019) 122066.  
<https://doi.org/10.1016/J.BIORTECH.2019.122066>.
- [169] S.D. Pore, D. Shetty, P. Arora, S. Maheshwari, P.K. Dhakephalkar, Metagenome changes in the biogas producing community during anaerobic digestion of rice straw, *Bioresour Technol* 213 (2016) 50–53.  
<https://doi.org/10.1016/J.BIORTECH.2016.03.045>.
- [170] J.W. Lim, J.A. Chiam, J.Y. Wang, Microbial community structure reveals how microaeration improves fermentation during anaerobic co-digestion of brown water and food waste, *Bioresour Technol* 171 (2014) 132–138.  
<https://doi.org/10.1016/J.BIORTECH.2014.08.050>.
- [171] B. Xiao, X. Tang, H. Yi, L. Dong, Y. Han, J. Liu, Comparison of two advanced anaerobic digestions of sewage sludge with high-temperature thermal pretreatment and low-temperature thermal-alkaline pretreatment, *Bioresour Technol* 304 (2020) 122979. <https://doi.org/10.1016/J.BIORTECH.2020.122979>.
- [172] S.F. Fu, F. Wang, X.S. Shi, R.B. Guo, Impacts of microaeration on the anaerobic digestion of corn straw and the microbial community structure, *Chemical Engineering Journal* 287 (2016) 523–528.  
<https://doi.org/10.1016/J.CEJ.2015.11.070>.
- [173] X.Z. Zhong, S.C. Ma, S.P. Wang, T.T. Wang, Z.Y. Sun, Y.Q. Tang, Y. Deng, K. Kida, A comparative study of composting the solid fraction of dairy manure with or without bulking material: Performance and microbial community dynamics, *Bioresour Technol* 247 (2018) 443–452.  
<https://doi.org/10.1016/J.BIORTECH.2017.09.116>.

- [174] K. Kampmann, S. Ratering, I. Kramer, M. Schmidt, W. Zerr, S. Schnell, Unexpected stability of Bacteroidetes and Firmicutes communities in laboratory biogas reactors fed with different defined substrates, *Appl Environ Microbiol* 78 (2012) 2106–2119. [https://doi.org/10.1128/AEM.06394-11/SUPPL\\_FILE/AEM-AEM06394-11-S04.PDF](https://doi.org/10.1128/AEM.06394-11/SUPPL_FILE/AEM-AEM06394-11-S04.PDF).
- [175] A. Mutungwazi, A. Awosusi, T.S. Matambo, Comparative functional microbiome profiling of various animal manures during their anaerobic digestion in biogas production processes, *Biomass Bioenergy* 170 (2023) 106728. <https://doi.org/10.1016/J.BIOMBIOE.2023.106728>.
- [176] H.J. Flint, C.S. Stewart, BACTEROIDES AND PREVOTELLA, *Encyclopedia of Food Microbiology* (1999) 198–203. <https://doi.org/10.1006/RWFM.1999.0160>.
- [177] S.K. Repinc, R. Šket, D. Zavec, K.V. Mikuš, F.G. Feroso, B. Stres, Full-scale agricultural biogas plant metal content and process parameters in relation to bacterial and archaeal microbial communities over 2.5 year span, *J Environ Manage* 213 (2018) 566–574. <https://doi.org/10.1016/J.JENVMAN.2018.02.058>.
- [178] N. Ketsub, P. Whatmore, M. Abbasabadi, W.O.S. Doherty, P. Kaparaju, I.M. O’Hara, Z. Zhang, Effects of pretreatment methods on biomethane production kinetics and microbial community by solid state anaerobic digestion of sugarcane trash, *Bioresour Technol* 352 (2022) 127112. <https://doi.org/10.1016/J.BIORTECH.2022.127112>.
- [179] J.A. Poveda-Giraldo, J.C. Solarte-Toro, C.A. Cardona Alzate, The potential use of lignin as a platform product in biorefineries: A review, *Renewable and Sustainable Energy Reviews* 138 (2021) 110688. <https://doi.org/10.1016/J.RSER.2020.110688>.

- [180] V. Ashokkumar, G. Flora, R. Venkatkarthick, K. SenthilKannan, C. Kuppam, G. Mary Stephy, H. Kamyab, W.H. Chen, J. Thomas, C. Ngamcharussrivichai, Advanced technologies on the sustainable approaches for conversion of organic waste to valuable bioproducts: Emerging circular bioeconomy perspective, *Fuel* 324 (2022) 124313. <https://doi.org/10.1016/J.FUEL.2022.124313>.
- [181] D.J. Shetty, P. Kshirsagar, S. Tapadia-Maheshwari, V. Lanjekar, S.K. Singh, P.K. Dhakephalkar, Alkali pretreatment at ambient temperature: A promising method to enhance biomethanation of rice straw, *Bioresour Technol* 226 (2017) 80–88. <https://doi.org/10.1016/J.BIORTECH.2016.12.003>.
- [182] S. Albornoz, V. Wyman, C. Palma, A. Carvajal, Understanding of the contribution of the fungal treatment conditions in a wheat straw biorefinery that produces enzymes and biogas, *Biochem Eng J* 140 (2018) 140–147. <https://doi.org/10.1016/J.BEJ.2018.09.011>.
- [183] A.S. Nizami, J.D. Murphy, What type of digester configurations should be employed to produce biomethane from grass silage?, *Renewable and Sustainable Energy Reviews* 14 (2010) 1558–1568. <https://doi.org/10.1016/J.RSER.2010.02.006>.
- [184] T. Menzel, P. Neubauer, S. Junne, Role of Microbial Hydrolysis in Anaerobic Digestion, *Energies* 2020, Vol. 13, Page 5555 13 (2020) 5555. <https://doi.org/10.3390/EN13215555>.
- [185] J. Kainthola, A. Podder, M. Fechner, R. Goel, An overview of fungal pretreatment processes for anaerobic digestion: Applications, bottlenecks and future needs, *Bioresour Technol* 321 (2021) 124397. <https://doi.org/10.1016/J.BIORTECH.2020.124397>.

- [186] A.K. Pandey, S. Pilli, P. Bhunia, R.D. Tyagi, R.Y. Surampalli, T.C. Zhang, S.H. Kim, A. Pandey, Dark fermentation: Production and utilization of volatile fatty acid from different wastes- A review, *Chemosphere* 288 (2022) 132444. <https://doi.org/10.1016/J.CHEMOSPHERE.2021.132444>.
- [187] S. Harirchi, S. Wainaina, T. Sar, S.A. Nojoumi, M. Parchami, M. Parchami, S. Varjani, S.K. Khanal, J. Wong, M.K. Awasthi, M.J. Taherzadeh, Microbiological insights into anaerobic digestion for biogas, hydrogen or volatile fatty acids (VFAs): a review, *Bioengineered* 13 (2022) 6521–6557. <https://doi.org/10.1080/21655979.2022.2035986>.
- [188] V.K. Varghese, B.J. Poddar, M.P. Shah, H.J. Purohit, A.A. Khardenavis, A comprehensive review on current status and future perspectives of microbial volatile fatty acids production as platform chemicals, *Science of The Total Environment* 815 (2022) 152500. <https://doi.org/10.1016/J.SCITOTENV.2021.152500>.
- [189] J. Zhang, C. Qi, Y. Wang, Y. Li, T. Han, X. Gong, M. Shan, G. Li, W. Luo, Enhancing biogas production from livestock manure in solid-state anaerobic digestion by sorghum-vinegar residues, *Environ Technol Innov* 26 (2022) 102276. <https://doi.org/10.1016/J.ETI.2022.102276>.
- [190] X. Li, X. Xiao, Y. Liu, G. Fang, P. Wang, D. Zou, Analysis of organic matter conversion behavior and kinetics during thermal hydrolysis of sludge and its anaerobic digestion performance, *J Environ Manage* 305 (2022) 114408. <https://doi.org/10.1016/J.JENVMAN.2021.114408>.
- [191] S. Baroutian, A.M. Smit, J. Andrews, B. Young, D. Gapes, Hydrothermal degradation of organic matter in municipal sludge using non-catalytic wet

- oxidation, *Chemical Engineering Journal* 260 (2015) 846–854.  
<https://doi.org/10.1016/J.CEJ.2014.09.063>.
- [192] L. Sillero, R. Solera, M. Perez, Effect of temperature on biohydrogen and biomethane production using a biochemical potential test with different mixtures of sewage sludge, vinasse and poultry manure, *J Clean Prod* 382 (2023) 135237.  
<https://doi.org/10.1016/J.JCLEPRO.2022.135237>.
- [193] N. Rahnama, H.L. Foo, N.A.A. Rahman, A. Ariff, U.K. Md Shah, Saccharification of rice straw by cellulase from a local *Trichoderma harzianum* SNRS3 for biobutanol production, *BMC Biotechnol* 14 (2014) 1–12.  
<https://doi.org/10.1186/S12896-014-0103-Y/TABLES/8>.
- [194] M. Wang, Y. Liu, X. Jiang, J. Fang, Q. Lyu, X. Wang, Z. Yan, Multi-omics reveal the structure and function of microbial community in co-digestion of corn straw and pig manure, *J Clean Prod* 322 (2021) 129150.  
<https://doi.org/10.1016/J.JCLEPRO.2021.129150>.
- [195] Alokika, B. Singh, Production, characteristics, and biotechnological applications of microbial xylanases, *Applied Microbiology and Biotechnology* 2019 103:21 103 (2019) 8763–8784. <https://doi.org/10.1007/S00253-019-10108-6>.
- [196] F.A. Shah, Q. Mahmood, N. Rashid, A. Pervez, I.A. Raja, M.M. Shah, Co-digestion, pretreatment and digester design for enhanced methanogenesis, *Renewable and Sustainable Energy Reviews* 42 (2015) 627–642.  
<https://doi.org/10.1016/J.RSER.2014.10.053>.
- [197] N. Akhtar, K. Gupta, D. Goyal, A. Goyal, Recent advances in pretreatment technologies for efficient hydrolysis of lignocellulosic biomass, *Environ Prog Sustain Energy* 35 (2016) 489–511. <https://doi.org/10.1002/EP.12257>.

- [198] T.R. Sarker, F. Pattnaik, S. Nanda, A.K. Dalai, V. Meda, S. Naik, Hydrothermal pretreatment technologies for lignocellulosic biomass: A review of steam explosion and subcritical water hydrolysis, *Chemosphere* 284 (2021) 131372. <https://doi.org/10.1016/J.CHEMOSPHERE.2021.131372>.
- [199] R. Ravindran, A.K. Jaiswal, A comprehensive review on pre-treatment strategy for lignocellulosic food industry waste: Challenges and opportunities, *Bioresour Technol* 199 (2016) 92–102. <https://doi.org/10.1016/J.BIORTECH.2015.07.106>.
- [200] N.A. Qambrani, M.M. Rahman, S. Won, S. Shim, C. Ra, Biochar properties and eco-friendly applications for climate change mitigation, waste management, and wastewater treatment: A review, *Renewable and Sustainable Energy Reviews* 79 (2017) 255–273. <https://doi.org/10.1016/J.RSER.2017.05.057>.
- [201] V. Chaturvedi, P. Verma, An overview of key pretreatment processes employed for bioconversion of lignocellulosic biomass into biofuels and value added products, *3 Biotech* 2013 3:5 3 (2013) 415–431. <https://doi.org/10.1007/S13205-013-0167-8>.
- [202] E.M. Blair, K.L. Dickson, M.A. O'Malley, Microbial communities and their enzymes facilitate degradation of recalcitrant polymers in anaerobic digestion, *Curr Opin Microbiol* 64 (2021) 100–108. <https://doi.org/10.1016/J.MIB.2021.09.008>.
- [203] J. Strakowska, L. Błaszczuk, J. Chełkowski, The significance of cellulolytic enzymes produced by *Trichoderma* in opportunistic lifestyle of this fungus, *J Basic Microbiol* 54 (2014) S2–S13. <https://doi.org/10.1002/JOBM.201300821>.

- [204] S.S. Adav, S.K. Sze, *Trichoderma Secretome: An Overview*, *Biotechnology and Biology of Trichoderma* (2014) 103–114. <https://doi.org/10.1016/B978-0-444-59576-8.00008-4>.
- [205] W. Lin, G. Jia, H. Sun, T. Sun, D. Hou, *Genome sequence of the fungus Pycnoporus sanguineus, which produces cinnabarinic acid and pH- and thermo- stable laccases*, *Gene* 742 (2020) 144586. <https://doi.org/10.1016/J.GENE.2020.144586>.
- [206] A. Zanellati, F. Spina, L. Rollé, G.C. Varese, E. Dinuccio, *Fungal Pretreatments on Non-Sterile Solid Digestate to Enhance Methane Yield and the Sustainability of Anaerobic Digestion*, *Sustainability* 2020, Vol. 12, Page 8549 12 (2020) 8549. <https://doi.org/10.3390/SU12208549>.
- [207] Y. Zhang, X. Chen, Y. Gu, X. Zhou, *A physicochemical method for increasing methane production from rice straw: Extrusion combined with alkali pretreatment*, *Appl Energy* 160 (2015) 39–48. <https://doi.org/10.1016/J.APENERGY.2015.09.011>.
- [208] F. Tang, J. Tian, N. Zhu, Y. Lin, H. Zheng, Z. Xu, W. Liu, *Dry anaerobic digestion of ammoniated straw: Performance and microbial characteristics*, *Bioresour Technol* 351 (2022) 126952. <https://doi.org/10.1016/J.BIORTECH.2022.126952>.
- [209] X. Zuo, H. Yuan, A.C. Wachemo, X. Wang, L. Zhang, J. Li, H. Wen, J. Wang, X. Li, *The relationships among sCOD, VFAs, microbial community, and biogas production during anaerobic digestion of rice straw pretreated with ammonia*, *Chin J Chem Eng* 28 (2020) 286–292. <https://doi.org/10.1016/J.CJCHE.2019.07.015>.
- [210] C. Gasch, I. Hildebrandt, F. Rebbe, I. Röske, *Enzymatic monitoring and control of a two-phase batch digester leaching system with integrated anaerobic filter*, *Energy Sustain Soc* 3 (2013) 1–11. <https://doi.org/10.1186/2192-0567-3-10/FIGURES/8>.

- [211] X. Wang, B. Yao, X. Su, Linking Enzymatic Oxidative Degradation of Lignin to Organics Detoxification, *International Journal of Molecular Sciences* 2018, Vol. 19, Page 3373 19 (2018) 3373. <https://doi.org/10.3390/IJMS19113373>.
- [212] Y. Zhao, C. Xu, S. Ai, H. Wang, Y. Gao, L. Yan, Z. Mei, W. Wang, Biological pretreatment enhances the activity of functional microorganisms and the ability of methanogenesis during anaerobic digestion, *Bioresour Technol* 290 (2019) 121660. <https://doi.org/10.1016/J.BIORTECH.2019.121660>.
- [213] R. Mahajan, S. Chandel, A.K. Puniya, G. Goel, Effect of pretreatments on cellulosic composition and morphology of pine needle for possible utilization as substrate for anaerobic digestion, *Biomass Bioenergy* 141 (2020) 105705. <https://doi.org/10.1016/J.BIOMBIOE.2020.105705>.
- [214] B.S. Donohoe, S.R. Decker, M.P. Tucker, M.E. Himmel, T.B. Vinzant, Visualizing lignin coalescence and migration through maize cell walls following thermochemical pretreatment, *Biotechnol Bioeng* 101 (2008) 913–925. <https://doi.org/10.1002/BIT.21959>.
- [215] M. Nazar, L. Xu, M.W. Ullah, J.M. Moradian, Y. Wang, S. Sethupathy, B. Iqbal, M.Z. Nawaz, D. Zhu, Biological delignification of rice straw using laccase from *Bacillus ligniniphilus* L1 for bioethanol production: A clean approach for agro-biomass utilization, *J Clean Prod* 360 (2022) 132171. <https://doi.org/10.1016/J.JCLEPRO.2022.132171>.
- [216] M.C. Popescu, C.M. Popescu, G. Lisa, Y. Sakata, Evaluation of morphological and chemical aspects of different wood species by spectroscopy and thermal methods, *J Mol Struct* 988 (2011) 65–72. <https://doi.org/10.1016/J.MOLSTRUC.2010.12.004>.

- [217] B.A. Udeh, E.A. Erkurt, Compositional and structural changes in *Phoenix canariensis* and *Opuntia ficus-indica* with pretreatment: Effects on enzymatic hydrolysis and second generation ethanol production, *Bioresour Technol* 224 (2017) 702–707. <https://doi.org/10.1016/J.BIORTECH.2016.11.015>.
- [218] J. Li, J. Rui, M. Yao, S. Zhang, X. Yan, Y. Wang, Z. Yan, X. Li, Substrate type and free ammonia determine bacterial community structure in full-scale mesophilic anaerobic digesters treating cattle or swine manure, *Front Microbiol* 6 (2015) 155601. <https://doi.org/10.3389/FMICB.2015.01337/BIBTEX>.
- [219] W. Tukangan, S. Hupfauf, M. Gómez-Brandón, H. Insam, W. Salvenmoser, P. Prasertsan, B. Cheirsilp, S. O-Thong, Symbiotic *Bacteroides* and *Clostridium*-rich methanogenic consortium enhanced biogas production of high-solid anaerobic digestion systems, *Bioresour Technol Rep* 14 (2021) 100685. <https://doi.org/10.1016/J.BITEB.2021.100685>.
- [220] Y. Yin, Z. Zhang, K. Yang, P. Gu, S. Liu, Y. Jia, Z. Zhang, T. Wang, J. Yin, H. Miao, Deeper insight into the effect of salinity on the relationship of enzymatic activity, microbial community and key metabolic pathway during the anaerobic digestion of high strength organic wastewater, *Bioresour Technol* 363 (2022) 127978. <https://doi.org/10.1016/J.BIORTECH.2022.127978>.
- [221] G. Singh, S. Samuchiwal, P. Hariprasad, S. Sharma, Melioration of Paddy Straw to produce cellulase-free xylanase and bioactives under Solid State Fermentation and deciphering its impact by Life Cycle Assessment, *Bioresour Technol* 360 (2022) 127493. <https://doi.org/10.1016/J.BIORTECH.2022.127493>.
- [222] W. Song, X. Wang, J. Gu, S. Zhang, Y. Yin, Y. Li, X. Qian, W. Sun, Effects of different swine manure to wheat straw ratios on antibiotic resistance genes and the

- microbial community structure during anaerobic digestion, *Bioresour Technol* 231 (2017) 1–8. <https://doi.org/10.1016/J.BIORTECH.2017.01.054>.
- [223] C. Sawatdeenarunat, K.C. Surendra, D. Takara, H. Oechsner, S.K. Khanal, Anaerobic digestion of lignocellulosic biomass: Challenges and opportunities, *Bioresour Technol* 178 (2015) 178–186. <https://doi.org/10.1016/J.BIORTECH.2014.09.103>.
- [224] M. Kumar Awasthi, B. Yan, T. Sar, R. Gómez-García, L. Ren, P. Sharma, P. Binod, R. Sindhu, V. Kumar, D. Kumar, B.A. Mohamed, Z. Zhang, M.J. Taherzadeh, Organic waste recycling for carbon smart circular bioeconomy and sustainable development: A review, *Bioresour Technol* 360 (2022) 127620. <https://doi.org/10.1016/J.BIORTECH.2022.127620>.
- [225] A. Anukam, A. Mohammadi, M. Naqvi, K. Granström, A Review of the Chemistry of Anaerobic Digestion: Methods of Accelerating and Optimizing Process Efficiency, *Processes* 2019, Vol. 7, Page 504 7 (2019) 504. <https://doi.org/10.3390/PR7080504>.
- [226] K. Hagos, J. Zong, D. Li, C. Liu, X. Lu, Anaerobic co-digestion process for biogas production: Progress, challenges and perspectives, *Renewable and Sustainable Energy Reviews* 76 (2017) 1485–1496. <https://doi.org/10.1016/J.RSER.2016.11.184>.
- [227] S. Emebu, J. Pecha, D. Janáčová, Review on anaerobic digestion models: Model classification & elaboration of process phenomena, *Renewable and Sustainable Energy Reviews* 160 (2022) 112288. <https://doi.org/10.1016/J.RSER.2022.112288>.

- [228] M. Khan, W. Chuenchart, K.C. Surendra, S. Kumar Khanal, Applications of artificial intelligence in anaerobic co-digestion: Recent advances and prospects, *Bioresour Technol* 370 (2023) 128501. <https://doi.org/10.1016/J.BIORTECH.2022.128501>.
- [229] F. Tufaner, Y. Demirci, Prediction of biogas production rate from anaerobic hybrid reactor by artificial neural network and nonlinear regressions models, *Clean Technol Environ Policy* 22 (2020) 713–724. <https://doi.org/10.1007/S10098-020-01816-Z/TABLES/6>.
- [230] I. Andrade Cruz, W. Chuenchart, F. Long, K.C. Surendra, L. Renata Santos Andrade, M. Bilal, H. Liu, R. Tavares Figueiredo, S.K. Khanal, L. Fernando Romanholo Ferreira, Application of machine learning in anaerobic digestion: Perspectives and challenges, *Bioresour Technol* 345 (2022) 126433. <https://doi.org/10.1016/J.BIORTECH.2021.126433>.
- [231] S. Zareei, J. Khodaei, Modeling and optimization of biogas production from cow manure and maize straw using an adaptive neuro-fuzzy inference system, *Renew Energy* 114 (2017) 423–427. <https://doi.org/10.1016/J.RENENE.2017.07.050>.
- [232] L. Alejo, J. Atkinson, V. Guzmán-Fierro, M. Roedel, Effluent composition prediction of a two-stage anaerobic digestion process: machine learning and stoichiometry techniques, *Environmental Science and Pollution Research* 25 (2018) 21149–21163. <https://doi.org/10.1007/S11356-018-2224-7/TABLES/5>.
- [233] C. Dong, J. Chen, Optimization of process parameters for anaerobic fermentation of corn stalk based on least squares support vector machine, *Bioresour Technol* 271 (2019) 174–181. <https://doi.org/10.1016/J.BIORTECH.2018.09.085>.

- [234] H. Abu Qdais, K. Bani Hani, N. Shatnawi, Modeling and optimization of biogas production from a waste digester using artificial neural network and genetic algorithm, *Resour Conserv Recycl* 54 (2010) 359–363. <https://doi.org/10.1016/J.RESCONREC.2009.08.012>.
- [235] P. Holubar, L. Zani, M. Hager, W. Fröschl, Z. Radak, R. Braun, Advanced controlling of anaerobic digestion by means of hierarchical neural networks, *Water Res* 36 (2002) 2582–2588. [https://doi.org/10.1016/S0043-1354\(01\)00487-0](https://doi.org/10.1016/S0043-1354(01)00487-0).
- [236] D. De Clercq, D. Jalota, R. Shang, K. Ni, Z. Zhang, A. Khan, Z. Wen, L. Caicedo, K. Yuan, Machine learning powered software for accurate prediction of biogas production: A case study on industrial-scale Chinese production data, *J Clean Prod* 218 (2019) 390–399. <https://doi.org/10.1016/J.JCLEPRO.2019.01.031>.
- [237] Multiple Regression, (n.d.). <https://home.csulb.edu/~msaintg/ppa696/696regmx.htm> (accessed December 5, 2023).
- [238] D. Singh, B. Singh, Investigating the impact of data normalization on classification performance, *Appl Soft Comput* 97 (2020) 105524. <https://doi.org/10.1016/J.ASOC.2019.105524>.
- [239] F. Elmaz, Ö. Yücel, A.Y. Mutlu, Predictive modeling of biomass gasification with machine learning-based regression methods, *Energy* 191 (2020) 116541. <https://doi.org/10.1016/J.ENERGY.2019.116541>.
- [240] A. Widodo, B.S. Yang, Support vector machine in machine condition monitoring and fault diagnosis, *Mech Syst Signal Process* 21 (2007) 2560–2574. <https://doi.org/10.1016/J.YMSSP.2006.12.007>.

- [241] M. Xu, P. Watanachaturaporn, P.K. Varshney, M.K. Arora, Decision tree regression for soft classification of remote sensing data, *Remote Sens Environ* 97 (2005) 322–336. <https://doi.org/10.1016/J.RSE.2005.05.008>.
- [242] F. Bagherzadeh, M.J. Mehrani, M. Basirifard, J. Roostaei, Comparative study on total nitrogen prediction in wastewater treatment plant and effect of various feature selection methods on machine learning algorithms performance, *Journal of Water Process Engineering* 41 (2021) 102033. <https://doi.org/10.1016/J.JWPE.2021.102033>.
- [243] S.S. Matin, S.C. Chelgani, Estimation of coal gross calorific value based on various analyses by random forest method, *Fuel* 177 (2016) 274–278. <https://doi.org/10.1016/J.FUEL.2016.03.031>.
- [244] F. Long, L. Wang, W. Cai, K. Lesnik, H. Liu, Predicting the performance of anaerobic digestion using machine learning algorithms and genomic data, *Water Res* 199 (2021) 117182. <https://doi.org/10.1016/J.WATRES.2021.117182>.
- [245] D. De Clercq, Z. Wen, F. Fei, Determinants of efficiency in anaerobic bio-waste co-digestion facilities: A data envelopment analysis and gradient boosting approach, *Appl Energy* 253 (2019) 113570. <https://doi.org/10.1016/J.APENERGY.2019.113570>.
- [246] R. Natras, B. Soja, M. Schmidt, Ensemble Machine Learning of Random Forest, AdaBoost and XGBoost for Vertical Total Electron Content Forecasting, *Remote Sensing* 2022, Vol. 14, Page 3547 14 (2022) 3547. <https://doi.org/10.3390/RS14153547>.



## List of Publications

### Journal Publications

- [1] **Rani, J.**, & Dhoble, A. S. (2023). Adaptability and diversity of core microbiome in evaluating the effect of digested versus raw manure in anaerobic digestion of rice straw. *Fuel*, 357, 2 2024. <https://doi.org/10.1016/j.fuel.2023.130010>
- [2] **Rani, J.**, & Dhoble, A. S. (2023). Effect of fungal pretreatment by *Pycnoporus sanguineus* and *Trichoderma longibrachiatum* on the anaerobic digestion of rice straw. *Bioresource Technology*, 387, 129503. <https://doi.org/10.1016/j.biortech.2023.129503>
- [3] **Rani, J.**, Pandey, K. P., Kushwaha, J., Priyadarsini, M., & Dhoble, A. S. (2022). Antibiotics in anaerobic digestion: Investigative studies on digester performance and microbial diversity. *Bioresource Technology*, 127662. <https://doi.org/10.1016/j.biortech.2022.127662>
- [4] **Rani, J.**, Stablein, M. J., Patel, K., Pang, X., Lahiri, P., Bhalerao, K. D., & Dhoble, A. S. (2023). Monitoring Effects of Tetracycline and Spectinomycin Perturbations on Biogas Production and Microbiome Dynamics in a Batch Mesophilic Anaerobic Digester. *BioEnergy Research*, 1-14. <https://doi.org/10.1007/s12155-023-10625-3>
- [5] Priyadarsini, M., Kushwaha, J., Pandey, K. P., **Rani, J.**, & Dhoble, A. S. (2023). Application of flow cytometry for rapid, high-throughput, multiparametric analysis of environmental microbiomes. *Journal of Microbiological Methods*, 106841. <https://doi.org/10.1016/j.mimet.2023.106841>
- [6] Singh, Y., **Rani, J.**, Kushwaha, J., Priyadarsini, M., Pandey, K. P., Sheth, P. N., ... & Dhoble, A. S. (2023). Scientific characterization methods for better utilization of

cattle dung and urine: a concise review. *Tropical Animal Health and Production*, 55(4), 274. <https://doi.org/10.1007/s11250-023-03691-4>

[7] Acharya, S., Dandigunta, B., Sagar, H., **Rani, J.**, Priyadarsini, M., Verma, S., ... & Dhoble, A. S. (2022). Analyzing Milk Foam Using Machine Learning for Diverse Applications. *Food Analytical Methods*, 15(12), 3365-3378. <https://doi.org/10.1007/s12161-022-02379-z>

[8] Kushwaha, J., Priyadarsini, M., **Rani, J.**, Pandey, K. P., & Dhoble, A. S. (2023). Aquaponic trends, configurations, operational parameters, and microbial dynamics: a concise review. *Environment, Development and Sustainability*, 1-34. <https://doi.org/10.1007/s10668-023-03924-4>

[9] Das, P. K., **Rani, J.**, Rawat, S., & Kumar, S. (2021). Microalgal co-cultivation for biofuel production and bioremediation: current status and benefits. *BioEnergy Research*, 1-26. <https://doi.org/10.1007/s12155-021-10254-8>

## Book Chapters

- [1] **Rani, J.**, Rautela, A., & Kumar, S. (2020). Biovalorization of winery industry waste to produce value-added products. In Biovalorisation of wastes to renewable chemicals and biofuels (pp. 63-85). Elsevier. <https://doi.org/10.1016/B978-0-12-817951-2.00004-3>
- [2] Priyadarsini, M., **Rani, J.**, Kushwaha, J., Pandey, K. P., Singh, Y., & Dhoble, A. S. (2023). An Introduction to Omics in Relevance to Industrial Microbiology. In Industrial Microbiology and Biotechnology: Emerging concepts in Microbial Technology (pp. 23-39). Singapore: Springer Nature Singapore. [https://doi.org/10.1007/978-981-99-2816-3\\_2](https://doi.org/10.1007/978-981-99-2816-3_2)
- [3] Pandey, K.P., Kushwaha, J., Priyadarsini, M., **Rani, J.**, Singh, Y., & Dhoble, A.S. (2023). Identification and culture test. In Antiviral and Antimicrobial Smart Coatings (pp. 113-139). Elsevier. <https://doi.org/10.1016/B978-0-323-99291-6.00014-1>
- [4] Kushwaha, J., **Rani, J.**, Priyadarsini, M., Pandey, K. P., & Dhoble, A. S. (2024). Assessment of wastes for future bioprospecting. In Processing of Biomass Waste (pp. 9-20). Elsevier. <https://doi.org/10.1016/B978-0-323-95179-1.00002-5>
- [5] **Rani, J.**, Pandey, K.P., Kushwaha, J., Priyadarsini, M., Acharya, S., Dhoble, A.S.\*; High Solids Anaerobic Digestion: An Overview and Recent Developments; Springer Nature (**Under Review**)

## **Patent**

A method for production of a cellulosic product from agricultural waste (Application No.: 202411047541) Inventors: **Jyoti Rani**, Abhishek Suresh Dhoble (Status: Published)

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Figure 1.1.: RM266YNAI3

Figure 2.2.: QU266ZUTL3

Figure 3.1. TO266ZV6HZ

Graphical abstract for Chapter 4: QI266ZVE9Cs

Graphical abstract for Chapter 6: HL266ZVUMX