CV of Md Mashiur Rahman, *MSc*

Graduate Research Assistant & PhD Candidate
The Pennsylvania State University
University Park, 16803, PA, USA
&
Scientific Officer (Agricultural Engineering)
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Research Interests

I am a researcher focusing on thermochemical conversion processes (such as pyrolysis, densification, torrefaction, gasification, hydrothermal conversion, and decarbonization of biomass/agricultural residues) and biomass energy systems for the production of clean biofuels and pellets sustainably that can be used for power and heating applications in a time of increasing population, industrial production, and changing climate where society can transform into zero-emission energy production and utilize it in a more environmentally friendly direction. Recently, I have focused on the sustainable co-production of biochar for agricultural applications and pyrolysis bio-oil for fuel applications from agricultural residues.

Keywords

Biomass conversion processes (thermochemical, biological), Biomass densification (pellets); Pyrolysis, Biomass gasification; Biomass energy generation (CHP) processes; Biochar production processes; Carbon negative technologies and Agricultural mechanization & machinery.

Education

Sep 2016- Aug 2018 **Master of Science in Engineering in Sustainable Energy, *Study Track:* Biofuels**
Technical University of Denmark (DTU), Denmark

Master thesis title: Commissioning, Test, and Evaluation of Low-Tar Biomass (LTB) Gasifier for Rural Applications

Recipient of Danish State Scholarship (partly)

Subjects covered: Biorefinery, Production of Biofuels, Energy and Sustainability, Thermal Gasification and Sustainability, Modelling and Analysis of Energy Systems using Operational Research, Life Cycle Assessment of Products and Systems, Process Design: Principles and Methods, Energy Economics, market and Policies, Feasibility Studies of Energy Projects, National Energy System Modelling with TIMES, Industrial Bioreaction Engineering, Recovery & Purification of Biological Products

Jan 2008-Jun 2009 **Master of Science in Farm Power & Machinery**
Bangladesh Agricultural University, Bangladesh

Master Thesis: An inventory model of local dealers of fertilizers

Subjects covered: Renewable Energy Systems, Bio-resources and Bio-system Modelling, Agricultural Power, Agricultural Machinery, Instrumentation (GIS & Remote Sensing), Engineering Mathematics, Advance Agricultural Process Engineering and Agricultural Systems Engineering

Jul 2003-Aug 2007

Bachelor of Science in Agricultural Engineering, *Study Track:* Agricultural power & machinery
Bangladesh Agricultural University, Bangladesh

Subjects Covered:
Renewable Energy: Renewable Energy Resources, Biomaterials and System
Agricultural Power & Machinery: Thermodynamics, Heat Engine, Engineering Mechanics, Agricultural Power & Machinery, Heat and Mass Transfer, Machine Design, Agricultural Mechanization, Ag. Process Engineering, Precision Agriculture, Refrigeration and Air Conditioning Engineering, Electrical Engineering, Electrical Machinery, Rural Electrification Engineering
Civil, Environmental & General Engineering: Environmental Engineering, Land Drainage and Reclamation, Engineering Materials, Strength of Materials, Soil Mechanics, and Environmental Impact Assessment, Engineering Management, Project Planning and evaluation, English, Chemistry, Physics, Mathematics, Sociology, Economic, Statistic

Research Experiences

Jun 2019- till now

Scientific officer (Agricultural Engineering)
Agricultural engineering division, Regional agricultural research station
Bangladesh Agricultural Research Institute (BARI), Jamalpur-2000, Bangladesh

Associated with the following research programme-

- Sustainable co-production of biochar for soil applications and pyrolysis bio-oil for fuel from agricultural residues
- Fuel-flexible, efficient and sustainable low-temperature pyrolizer of jute stick for tri-generation of syngas, biochar and ashes
- Gasification biochar as a soil amendment for carbon sequestration and soil quality
- Negative emissions technologies of sustainable agricultural production systems through carbon sequestration in soil.

Working languages: Bangla, English

Jan 2018-Aug 2018

Master Thesis Student
Work on commissioning, test and evaluation low-tar biomass (LTB) gasifier for rural applications.
Department of chemical engineering, DTU Risø campus, Roskilde-4000, Denmark.

Associated with the development, commissioning and characterization of LTB gasifier for rural applications, where LTB gasifier results in almost tar-free producer gas (7.4 – 29.8 mg/Nm^3) suitable for direct use in an engine. Execution of this research through the following objectives

- Optimization/testing of the nozzle design for proper recirculation and mixing of the pyrolysis gas
- Characterization and operation tests of the gasifier with biomass pellets and chips, including- mass and energy balances, calculation of gasifier capacity, characterization of the gas produced, calculation of energy efficiency, optimization of the operation parameters and test of the engine performance with the gasifier producer gas
- Modeling of gasifier operation by modification of an already existing equilibrium-based model

Working languages: English

Jun 2011-Jun 2015 **Scientific officer (Agricultural Engineer)**
Farm Machinery Technology Development and Dissemination Project
Farm Machinery and Postharvest Process Engineering Division, Bangladesh Agricultural Research Institute (BARI), Gazipur, Bangladesh

Major responsibilities:

- Implement renewable energy and agricultural machinery research activities, including developing, commissioning and implementing research, and analyzing research data and preparing detailed reports and presentations.
- Responsible for effective management of all project planning activities and developing an annual work program that links into the overall project and provides the necessary assistance in the development of the budget, economic and other related activities

Working languages: Bangla, English

Work Experiences

Sep 2015-Aug 2016 **Agricultural Machinery Development Officer**
International Maize and Wheat Improvement Center (CIMMYT), Barisal hub office, Bangladesh

Major responsibilities:

- Delivered agriculture and machinery research and development of an agronomic system and agricultural machinery technologies that are appropriate to the diverse cropping systems and socioeconomic environments of Southern Bangladesh
- Assists in agricultural machinery research activities, including maintenance of agronomic, machinery, and survey-focused research data in collaboration with farmers, agricultural service providers, and the public and private sector

Mar 2009-May 2011 **Agricultural Engineer**
Department of Agricultural Extension, Upazila Agriculture Office, Lalmonirhat, Bangladesh

Major responsibilities:

- Extension of on-farm water management practices through demonstrations to increase irrigation efficiency. Reconstruct and re-excavate canals and other water bodies on a partnership basis to improve surface water use for irrigation purposes. Increase cropping intensity, and reduce grain loss by encouraging the use of agricultural machinery

Software/Computer Packages /Technical Skills

Programming:	MATLAB, CFD analysis (ANSYS-Fluent version 19.2), Engineering Equation Solver (EES), TIMES, GAMS, Statistical analysis in R
CAD Software:	SolidWorks, AutoCAD, MasterCAM CNC Software
Others:	LaTeX, MS Office

Grants/Scholarships

- Danish State Scholarship (Partly) for MSc in Engineering in Sustainable Energy, Technical University of Denmark (DTU), Denmark
- University grant scholarship for Bachelor project in Agricultural Engineering, Bangladesh Agricultural University, Bangladesh

Languages

Bangla: Mother tongue
English: Fluent in writing and conversation
Hindi: Basic
Danish: Preliminary Basic

Official IELTS Scores

Test Date	**Total (Composite Score)**	Listening	Reading	Writing	Speaking
09-26-2022	**7.00**	7.50	7.00	6.00	6.50

Countries Visited in (Denmark – Lived in for 2 years and 9 months)

South Asia (Bangladesh, India); Europe (Denmark, Germany, Sweden, Norway, Spain, France, Portugal, Finland, Latvia, Lithuania and Estonia)

Speaking Events

Sep 15, 2021 — Speaker at 1st ASEAN International Conference on Energy and Environment (AICEE), High Efficient gasification in a Low-tar biomass (LTB) gasifier by Coupling with Inclined Nozzle and Combustor for Tar Reduction, ASEAN Centre for Energy (ACE), Bandar Seri Begawan, Brunei.

Oct 03, 2019 — Speaker at RECON 2nd International conference on renewable energy, topic: Emerging Markets & Investment Opportunities on Sustainable Energy- an approach to bioenergy. Bangladesh renewable energy expo, Dhaka, Bangladesh.

Jun 25, 2018 — A poster presentation on the Low-tar biomass gasifier: a sustainable production of producer gas for power and heat at Green Challenge (Grøn Dyst) student conference on sustainability, environment and climate technology, Organized by DTU. http://www.groendyst.dtu.dk.

Research Publications

Published peer-reviewed articles: Total number of publications = 16. Most recent publications are listed below:

Shikha, F.S., **Rahman, M. M.,** Sultana, N. et al. (2023). **Effects of biochar and biofertilizer on groundnut production: a perspective for environmental sustainability in Bangladesh.** *Carbon Research* Journal. *Published by Springer.* 2, 10 (2023). https://doi.org/10.1007/s44246-023-00043-7 [Click here]

Rahman, M.M. et al. (2022). **Designing an Energy Use Analysis and Life Cycle Assessment of the Environmental Sustainability of Conservation Agriculture Wheat Farming in Bangladesh**. In: Muthu, S.S. (eds) Environmental Footprints of Crops. Environmental Footprints and Eco-design of Products and Processes. Springer, Singapore. *Published by Springer.* https://doi.org/10.1007/978-981-19-0534-6_5 [Click here]

Rahman, M. M. (2022). **Test and performance optimization of nozzle inclination angle and swirl combustor in a low-tar biomass gasifier: a biomass power generation system perspective**. *Carbon Resources Conversion* Journal. *Hosted and published by Elsevier.* Vol 5, Issue 2. Pages 139-49. https://doi.org/10.1016/j.crcon.2022.01.002 [Click here]

Rahman, M. M.; Aravindakshan, S.; Matin, M. A. (2021). **Design and Performance Evaluation of Inclined Nozzles and Combustor of a Biomass Gasifier for Tar Reduction**. *Renewable Energy* Journal. *Published by Elsevier.* Vol 172. pages 239-250. https://doi.org/10.1016/j.renene.2021.02.156 [Click here]

Rahman, M.M.; Henriksen, U.B.; Ahrenfeldt J.; Arnavat M.P. (2020). **Design, construction and operation of a low-tar biomass (LTB) gasifier for power applications**, *Energy* Journal. *Published by Elsevier.* Vol. 204. https://doi.org/10.1016/j.energy.2020.117944 [Click here]

Rahman, M. M.; Aravindakshan, S. (2021). **Conservation tillage for climate-smart sustainable intensification: Assessing the impact on soil organic carbon accumulation, GHG emission and water footprint in wheat crop in**

Bangladesh. *Environmental and Sustainability Indicators* Journal. Published by Elsevier. Vol 10. https://doi.org/10.1016/j.indic.2021.*100106* [Click here]

Miah, M.S., **Rahman, M.M.**, Hoque, M.A. et al. (2022). **Design and Performance Evaluation of NPK Briquette Applicator for Small-Scale Upland Crops**. Journal of Biosystems Engineering. *Published by Springer.* 47, 270–285 (2022). https://doi.org/10.1007/s42853-022-00145-x [Click here]

Sayed, A; Sarker, A; Kim, J E; **Rahman, M. M.**; Mahmud, M G A (2020). **Environmental sustainability and water productivity on conservation tillage of irrigated maize in red brown terrace soil of Bangladesh**. Journal of the Saudi Society of Agricultural Sciences. *Hosted and published by Elsevier*. Volume 19, Issue 4, Pages 276-284. https://doi.org/10.1016/j.jssas.2019.03.002 [Click here]

Peer Reviewing & Journal Editorial Board

a. Member, Youth Editorial Board, ***Carbon Research*** **journal** (Springer Nature)

b. Reviewer activities until April 16, 2023

SL No.	Journal Name	Publisher	No. of Reviews
01	Renewable energy	Elsevier	04
02	Energy reports	Elsevier	08
03	Bioresource technology reports	Elsevier	03
04	Sustainable energy technologies and assessments	Elsevier	03
05	Environmental progress & sustainable energy	Wiley	09
06	International journal of energy research	Wiley	01
07	Journal of renewable energy and environment	MERC, Iran	14
08	Propulsion and power research	Elsevier	01
09	Carbon Research	Springer	08
10	Archives of agronomy and soil science	Taylor & Francis	01
11	Computational and Structural Biotechnology Journal	Elsevier	01
12	Environmental Science and Pollution Research	Springer	02
13	International journal of ecology	Hindawi	01
14	International journal of environmental science and technology	Springer	17
15	PloS one	PloS one	03
16	Soil & tillage research	Elsevier	01
17	Cogent social sciences	Taylor & Francis	01
18	International Journal of Ecology	Hindawi	01
	Total		**79**

Membership in Professional Bodies

- Association of Energy Engineers: Georgia, US (Member International III)
- International Association for Agricultural Sustainability: Singapore (Individual Membership)
- Institute of Engineers Bangladesh: Dhaka, Bangladesh (Life Member)
- Nordic Biochar Network (NBN)(Member)
- International Association of Carbon Capture (IACC)(Senior Member)

References

Daniel Ciolkosz, PhD

Associate Research Professor, Department of Agricultural and Biological Engineering, The Pennsylvania State University, 306 Agricultural Engineering Building, Shortlidge Road, University Park, 16802, PA, USA. Advisor on PhD Thesis Project, Email: dec109@psu.edu, +18148633484

Jesper Ahrenfeldt, PhD

Chief Engineer at Stiesdal SkyClean A/S, Roskilde, Zealand, Denmark & Former Senior Researcher & Head of Biomass Gasification Group, Department of Chemical Engineering, DTU. Supervisor on Master Thesis Project. Email: jah@stiesdal.com, +45 21 32 53 44

Tobias Pape Thomsen, PhD

Associate Professor, Department of People and Technology, TRANSITIONS – Sustainability Transitions and Environmental Planning, Universitetsvej 1, Building 02.1, DK-4000 Roskilde, Denmark. Email: tpapet@ruc.dk, +45 2235 4425

Abutaher M Ziauddin, PhD

Adjunct Professor, Department of Mechanical Engineering Technology, New York City College of Technology/City University of New York, Brooklyn, New York 11201, USA. Supervisor on Bachelor Thesis Project. Email: ziauddin_atm@yahoo.com, +1 347 221 9115

"I certify that all information stated in this resume is true and complete to the best of my knowledge".

Date: 11.01.2023

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(Md Mashiur Rahman)