Ashish Manandhar

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EDUCATION

Ph.D. in Food, Agricultural and Biological Engineering 2019
The Ohio State University, Columbus, OH
Dissertation: Techno-economic and life cycle analyses of lactic acid production from starch and lignocellulosic biofeedstocks

M.S. in Sustainable Energy Engineering, Mechanical Engineering 2011
KTH Royal Institute of Technology, Stockholm, Sweden
Thesis: Standardized simulation of solar assisted heat pump for buildings

B.E. in Agricultural Engineering 2006
Tribhuvan University, Institute of Engineering, Nepal

PROFESSIONAL EXPERIENCE

Research Scientist, The Ohio State University (OSU), OH, USA Oct 2021 - Present
- Research and management of innovative and multidisciplinary projects related to product logistics, biodegradable packaging materials, carbon storage technologies, unmanned aerial vehicles for agriculture and waste recycling
- Developed scalable TEA and LCA models with customer inputs for multidisciplinary projects and identified hotspots to reduce carbon intensity, waste and costs
- Secured $1.25 million funding as co-investigator for projects funded by U.S. Department of Energy and U.S. Department of Agriculture
- Contributed as co-investigator for proposals totaling $20+ million. My role in these projects was to develop TEA and LCA models to evaluate the environmental sustainability, scalability and feasibility at commercial operation scale of different technologies
- Mentored post-docs, graduate and undergraduate students on different projects
- Facilitated a workshop on 'Toward a Circular Bioeconomy' aimed at connecting academia with representatives from relevant industries and commodity groups

Post-doctoral Researcher, The Ohio State University, OH, USA May 2019 – Sep 2021
- Project management and research (systems analysis) on topics of waste upcycling, supply chain of raw material and biobased products at local, regional and global scales
- Developed the course '*Biomass Conversion to Bioenergy'*, delivered lectures and coordinated prominent researchers as guest lecturers
- Provided guest lecture on TEA and LCA of using unmanned aerial systems and remote sensing for agricultural and logistics applications for the course '*Unmanned Aerial Systems and Remote Sensing'*

Research Scholar, Palo Alto Research Centre (Xerox PARC), Palo Alto, CA Oct 2011 – Mar 2015
- Engineering and materials research on high energy density and capacity Li-ion batteries, and optical fiber based battery monitoring technologies for consumer electronics and electric vehicle applications
- Testing Li-ion batteries in accordance with different standards
- Evaluated tradeoffs in performance improvements and costs/environmental impacts of Li-ion batteries production methods in commercial scale

Research Assistant, Fraunhofer Institute for Solar Energy Systems, Germany Jan 2010 – Aug 2011
- Developed scalable thermal simulation models for a system that integrates energy efficient building, solar and heat pump technologies based on EU and German standards to optimize their energy use
- Testing solar thermal systems in accordance with different standards

Research and Teaching Assistant, KTH Royal Institute of Technology, Sweden Dec 2008 – Dec 2009
- Analyzed the techno-economic feasibility of concentrated solar integrated micro-turbines based on experimental, literature and market data – Solar Explore Project
- Helped in developing CompEdu, an educational platform for on-campus and distance-learning students of Sustainable Energy Engineering course

Technical Officer, United Nations Development Program (UNDP), Nepal Jan 2006 – Oct 2008

- Project management of solar and hydro power plants with emphasis on hybrid and multipurpose projects based on feedbacks from the community

TEACHING EXPERIENCE

Course Co-instructor Spring 2020 and Spring 2023

Department of Food, Agricultural and Biological Engineering (FABE), OSU

Course title: Biomass Conversion to Bioenergy. 3 cr.

Topics: Biomass feedstocks; biomass harvest and post-harvest logistics; biomass conversion through biochemical and thermochemical routes; technoeconomic analysis (TEA) and life cycle assessment (LCA)

Developed the course and delivered 30% of the course

- Coordinated guest lectures from prominent researchers in their respective field

Course assistant and Guest lecturer Spring and Autumn 2023

Department of Food, Science and Technology, OSU

Course title: Sustainability of the Food Supply Chain. 3 cr.

- Lectured on conducting LCA of food supply systems
- Assisted in 21 different LCA projects for different food systems conducted by the students

Guest Lecturer Spring 2020-2023

Department of Food, Agricultural and Biological Engineering (FABE), OSU

Course title: Unmanned Aerial Systems and Remote Sensing. 3 cr.

- Lectured on conducting TEA and LCA of using unmanned aerial systems and remote sensing technologies for agricultural and logistics applications

CompEdu Assistant 2008 - 2009

KTH Royal Institute of Technology, Sweden

Sustainable Energy Engineering (SEE) Distance Learning Initiative (CompEdu)

- Assisted in preparation of online notes for CompEdu, an educational platform for on-campus and distance-learning students of Sustainable Energy Engineering course

PUBLICATIONS

Peer-reviewed publications

1. **Manandhar, A**. and Shah, A., 2023. Techno-economic analysis of the production of lactic acid from lignocellulosic biomass. Fermentation, 9(7), p.641.
2. Sivaprasad, S., Jayaseelan, A., Kannappan Panchamoorthy, G., Gautam, R., **Manandhar, A.,** Shah, A., 2022. Biomass as source for hydrochar and biochar production to recover phosphates from wastewater: A review on challenges, commercialization, and future perspectives. Chemosphere 286, p.131490.
3. Khanal, A., **Manandhar, A**., Adhikari, S. and Shah, A., 2021. Techno-economic analysis of novolac resin production by partial substitution of petroleum-derived phenol with bio-oil phenol. Biofuels, Bioproducts and Biorefining, 15(6), pp.1611-1620.
4. Shah, A., **Manandhar, A.** and Darr, M.J., 2021. Near-term practical strategies to improve the life cycle techno-economics, energy use and greenhouse gas emissions of corn stover supply system for biobased industries. Biofuels, Bioproducts and Biorefining, 15(3), p.793-803.
5. **Manandhar, A.**, Zhu, H., Ozkan, E. and Shah, A., 2020. Techno-economic impacts of using a laser-guided variable-rate spraying system to retrofit conventional constant-rate sprayers. Precision Agriculture, pp.1-16.
6. **Manandhar, A.** and Shah, A., 2020. Techno-economic analysis of bio-based lactic acid production utilizing corn grain as feedstock. Processes, 8(2), p.199.
7. Khanal, A., **Manandhar, A.** and Shah, A., 2019. Physicochemical and structural characteristics of corn stover and cobs after physiological maturity. BioEnergy Research, p.1-10.
8. **Manandhar, A.**, Milindi, P. and Shah, A., 2018. An overview of the post-harvest grain storage practices of smallholder farmers in developing countries. Agriculture, 8(4), p.57.
9. Li, Y., **Manandhar, A.**, Li, G. and Shah, A., 2018. Life cycle assessment of integrated solid-state anaerobic digestion and composting for on-farm organic residues treatment. Waste Management, *76*, p.294-305.

10. **Manandhar, A.** and Shah, A., 2017. Life cycle assessment of feedstock supply systems for cellulosic biorefineries using corn stover transported in conventional bale and densified pellet formats. Journal of Cleaner Production, 166, p.601-614.
11. Vasco-Correa, J., Khanal, S., **Manandhar, A.** and Shah, A., 2017. Anaerobic digestion for bioenergy production: Global status, environmental and techno-economic implications, and government policies. Bioresource technology, 247, p.1015-1026.
12. Bae, C.J., **Manandhar, A.**, Kiesel, P. and Raghavan, A., 2016. Monitoring the strain evolution of lithium-ion battery electrodes using an optical fiber bragg grating sensor. Energy Technology, 4(7), p.851-855.

Patent

1. Bae, C.J., Shrader, E.J. and **Manandhar, A.**, Palo Alto Research Center Inc, 2018. High energy and power Li-ion battery having low stress and long-term cycling capacity. U.S. Patent 9,882,200.

Book chapters

1. Shah, A., Baral, N.R. and **Manandhar, A.,** 2016. Techno-economic analysis and life cycle assessment of bioenergy systems. In Advances in Bioenergy (Vol. 1, pp. 189-247). Elsevier.
2. **Manandhar, A.,** Mousavi-Avval, S.H., Tatum, J., Shrestha, E., Nazemi, P. and Shah, A. Shah, 2022. Solid biofuels. Biomass, Biofuels, Biochemicals, Green-Economy: Systems analysis for sustainability. pp.343-370. Elsevier.

Encyclopedia chapters

1. Shah, A. and **Manandhar, A.,** 2016. Lignocellulosic biomass feedstock logistics. In: Encyclopedia of Agricultural, Food, and Biological Engineering (Second Edition). Edited by: D. Heldman and C. Moraru. Taylor and Francis LLC Encyclopedia Program.
2. **Manandhar, A.,** Mousavi-Avval, S.H., and Shah, A. 2018. Sustainability Assessment for Production Agriculture, Encyclopedia of Agricultural, Food, and Biological Engineering (In review).

Factsheets

1. **Manandhar, A.** and Shah, A. 2021. Improving biomass properties via densification and upgrading. Factsheet No. FABE-660.5. Ohio State University Extension.
2. Sivaprasad, S., **Manandhar, A.** and Shah, A. 2021. Hydrothermal carbonization: Upgrading waste biomass to char, Factsheet No. FABE-662.2, Ohio State University Extension.
3. Mousavi-Avval, S.H., **Manandhar, A.** and Shah, A. 2018. Fundamentals of energy analysis for crop production agriculture, Factsheet No. FABE-662.1, Ohio State University Extension.
4. Vasco-Correa, J., **Manandhar, A.** and Shah, A. 2018. Economic implications of anaerobic digestion for bioenergy production and waste management, Factsheet No. FABE-661.1, Ohio State University Extension.
5. **Manandhar, A.** and Shah, A. 2018. Feedstock Logistics for Agricultural Residues and Energy Crops: Moving biomass from the field to biorefinery gate, Factsheet No. FABE-660.4, Ohio State University Extension.
6. Shah, A. and **Manandhar, A.**, 2017. Torrefaction: Upgrading Biomass to "Green Coal", Factsheet No. FABE 660.3, Ohio State University Extension.
7. Shah, A., **Manandhar, A.**, Khanal, S. and Ozkan, E. 2017. Status of Biorefineries in Ohio, Factsheet No. FABE-660.2, Ohio State University Extension.

Trade journal/Magazine articles

1. **Manandhar, A.** and Shah, A. 2021. Hydrothermal carbonization – Upgrading organic waste to char. Ohio's Country Journal.
2. Shah, A., Wicks, M. and **Manandhar, A.** 2018. Pipeline to commercialization. Ohio's Country Journal.

Industry research reports

1. Heldman, D.R., Shah, A., Gummalla, S. and **Manandhar, A.** 2022. Sustainability of the frozen mango supply chain. National Mango Board.
2. **Manandhar, A.**, Antin, K., Roncalli, J., Davis, M., Han, L., Hagström, P. 2010. Techno-economic analysis of poly-generation options for combined heat and power plant in Uppsala, Vattenfall AB, Uppsala, Sweden
   - Investigated the techno-economic feasibility of a poly-generation system producing heat, electricity and ethanol from lignocellulosic biomass and municipal waste.

Manuscripts in preparation

1. Dey, S., **Manandhar, A.**, Shah, A. and Vodovotz, Y. 2023. Upcycling ground coffee waste to produce plant-based coating with reduced carbon footprint. Planned submission to the Journal of Cleaner Production.
2. **Manandhar, A.,** Dami, I. and Shah, A. 2023. Techno-economic analysis of using biomass mulches for winter protection of vineyards in Ohio. Planned submission to the Journal of ASABE.
3. **Manandhar, A.,** Heldman, D. and Shah, A. 2023. Life cycle assessment of frozen mango supplied from Peru to Ohio. Planned submission to the Journal of Cleaner Production.
4. **Manandhar, A.,** Khanal, S. and Shah, A. 2023. Techno-economic analysis of implementing unmanned aerial systems and machine learning models for corn crop health monitoring. Planned submission to Precision Agriculture Journal.
5. **Manandhar, A.** and Shah, A. 2023. Life cycle assessment of biobased lactic acid production from starch and lignocellulosic feedstocks. Planned submission to Sustainability Journal.
6. Sivaprasad, S., **Manandhar, A.** and Shah, A. 2023. Biobased dye adsorbents derived from hydrothermal carbonization and modification of anerobic digestate. Planned submission to Waste Management Journal.

SCHOLARLY PRESENTATIONS

Conference presentations

1. **Manandhar, A.**, Dami, I. and Shah, A. 2023. Techno-economic analysis of using biomass mulches for winter protection of vineyards in Ohio. American Society of Agricultural and Biological Engineers (ASABE) Annual International Meeting (AIM), July 9-12, Omaha, NE. (Poster)
2. **Manandhar, A**., Khanal, S. & Shah, A. 2023. Techno-economic analysis of implementing UAV technologies for crop health monitoring. ASABE Annual International Meeting, July 9-12, Omaha, NE. (Poster)
3. **Manandhar, A.**, Dami, I. and Shah, A. 2023. Techno-economic analysis of using biomass mulches for winter protection of vineyards in Ohio. The Ohio State University CFAES Research Conference 2023, April 27-30, Columbus, OH. (Poster)
4. Dhakal, S., Khanal, S., **Manandhar, A.**, and Shah, A., 2023. Monitoring surface coal mine areas using remote sensing. The Ohio State University CFAES Research Conference 2023, April 27-30, Columbus, OH. (Poster)
5. **Manandhar, A.**, Dami, I. and Shah, A. 2023. Techno-economic analysis of using biomass mulches for winter protection of vineyards in Ohio. The Ohio State University Plant Sciences Symposium 2023, March 2-3, Columbus, OH. (Poster)
6. **Manandhar, A.** Heldman, D. and Shah, A. 2022. Life cycle assessment of the logistics of frozen and fresh mango from Peru to Ohio. ASABE Annual International Meeting 2022, July 17-20, Houston, TX. (Oral)
7. **Manandhar, A.** and Shah, A. 2022. Life cycle assessment of biodegradable plastic film production for packaging using biobased feedstocks. ASABE Annual International Meeting 2022, July 17-20, Houston, TX. (Poster)
8. Michel, F., Shrestha, E., **Manandhar, A.**, Floom, M., Curtis, K., Sweeney, G., Rodriguez, M., Altland, J. and Shah, A. 2022. Sustainable urban agriculture in the post-industrial Midwestern USA, The International Horticultural Congress – 2022, August 14-20, Angers, France. (Poster)
9. **Manandhar, A.,** Akula, A., Dami, I. and Shah, A. 2022. Evaluation of mulcher equipment for winter vine protection. Vineyard Field Day 2022, August 11, Kingsville, OH. (Poster)
10. **Manandhar, A.,** Dami, I. and Shah, A. 2022. Preliminary techno-economic analysis of vineyard mulching. Vineyard Mulching Workshop: Benefits beyond Winter Protection. June 2, 2022, Virtual. (Oral)
11. **Manandhar, A.,** Khanal, S. & Shah, A. 2021. Techno-economic analysis of implementing UAV technologies for crop health monitoring. ASABE Annual International Meeting 2021, July 12-16, Virtual Conference. (Oral)
12. **Manandhar, A.,** Khanal, S. and Shah, A.2021. Techno-economic analysis of switchgrass based combined heat and power system. ASABE Annual International Meeting 2021, July 12-16, Virtual Conference. (Oral)
13. Shah, A. **Manandhar, A.** and Sivaprasad, S. 2021. Remediation of methylene blue from water using hydrochar produced from anaerobically digested effluent from sewage sludge. ASABE Annual International Meeting 2021, July 12-16, Virtual Conference. (Poster)

14. **Manandhar, A.,** Khanal, S. & Shah, A. 2021. Techno-economic analysis of implementing unmanned aerial systems for corn crop health monitoring. The Ohio State University - College of Food, Agricultural and Environmental Sciences (CFAES) Annual Research Conference 2021, April 8. Virtual Conference. (Poster)
15. Shrestha, E., **Manandhar, A.** and Shah, A. 2021. Life cycle assessment of spinach grown in an urban farm in Mansfield, Ohio. CFAES Annual Research Conference 2021, April 8. Virtual Conference. (Poster)
16. Sivaprasad, S., **Manandhar, A.** and Shah, A. 2021. Fixed-bed continuous remediation of methylene blue dye using hydrochar derived from sewage sludge digestate. The CFAES Annual Research Conference, April 8, virtual. (Poster)
17. **Manandhar, A**., Zhu, H., Ozkan, E. and Shah, A. 2020. Techno-economic impacts of laser-guided variable-rate pesticide application for maintaining the health of nursery crops. Ohio State University Plant Sciences Symposium 2020. (Poster)
18. **Manandhar, A.** and Shah, A. 2020. Techno-economic and life cycle analyses of biobased lactic acid production. CFAES Annual Research Conference 2020, April 24, Columbus, OH. (Poster)
19. Shrestha, E., **Manandhar, A.** and Shah, A. 2020. Greenhouse gas emissions analysis of lettuce grown in an urban farm in Ohio. CFAES Annual Research Conference 2020, April 24, Columbus, OH. (Poster)
20. Sivaprasad, S., **Manandhar, A.** and Shah, A. 2020. Adsorptive removal of dyes using char derived from anerobic digestate. CFAES Annual Research Conference 2020, April 24, Columbus, OH. (Poster)
21. **Manandhar, A.** and Shah, A. 2019. Evaluating uncertainties in feedstock supply systems for a lignocellulosic biorefinery. ASABE Annual International Meeting 2019, July 7-10, Boston, MA. (Oral)
22. **Manandhar, A.** and Shah, A. 2019. Process-based life cycle assessment of lactic acid production from corn grain and corn stover. ASABE Annual International Meeting 2019, July 7-10, Boston, MA. (Poster)
23. **Manandhar, A.** and Shah, A. 2018. Process-based life cycle assessment of lactic acid production from corn stover and miscanthus, CFAES Annual Research Conference at The Ohio State University 2018, April 22, Columbus, OH. (Poster)
24. **Manandhar, A.** and Shah, A. 2018. Life cycle assessment of lactic acid production from corn stover and switchgrass, 10th Tripartite Meeting 2018, October 27, Columbus, OH. (Oral)
25. **Manandhar, A.** and Shah, A. 2018. Techno-economic analysis of using a conventional sprayer retrofitted with intelligent control functions for pesticide application in nursery crops, ASABE Annual International Meeting 2018, July 29- August 1, Detroit, MI. (Oral)
26. **Manandhar, A.** and Shah, A. 2018. Feedstock logistics for an integrated corn stover and energy crop based lignocellulosic biorefinery, ASABE Annual International Meeting 2018, July 29- August 1, Detroit, MI. (Oral)
27. Khanal A, **Manandhar A.** and Shah A. 2018. Techno-economic analysis of the production of novolac resin by partial substitution of petroleum based phenol with phenolic compounds present in bio-oil derived from fast pyrolysis of pine-wood. (Oral) Presented at:
    - ASABE Annual International Meeting, July 29- August 1, 2018, Detroit, MI.
    - 2018 Northeast Agricultural and Biological Engineering Conference (NABEC), July 15-18, 2018, Morgantown, WV.
28. **Manandhar, A.** and Shah, A. 2018. Techno-economic analysis of lactic acid production from lignocellulosic biomass, S1041 Annual Meeting and Symposium, 2018, July 9-10, Madison, WI. (Poster)
29. **Manandhar, A.** and Shah, A. 2018. Techno-economic analysis of corn grain logistics from the field to biorefinery, S1041 Annual Meeting and Symposium, 2018, July 9-10, Madison, WI. (Poster)
30. **Manandhar, A.,** Zhu, H., Ozkan, E. and Shah, A. 2018. Evaluating techno-economic impacts of using conventional sprayer retrofitted with intelligent control functions for pesticide application in apple orchards. (Poster) Presented at:
    - Plant Sciences Symposium at The Ohio State University 2018, April 6-7, Wooster, OH.
    - CFAES Annual Research Conference at The Ohio State University 2018, April 27, Wooster, OH. (Poster)
31. Khanal, A., **Manandhar, A.** and Shah, A. Evaluating the distribution of biomass composition and nutrients in corn plant after physiological maturity for sustainable biofuel production. (Poster) Presented at:
    - Plant Sciences Symposium at The Ohio State University 2018, April 6-7, 2018 Wooster, OH.
    - CFAES Annual Research Conference at The Ohio State University, April 27, 2018, Wooster, OH.

32. **Manandhar, A.**, Shah, A., Zhu, H. and Ozkan, E. 2017. Techno-economic analysis of implementing the intelligent pesticide sprayer for specialty crop production. ASABE Annual International Meeting 2017, July 16-19, Spokane, WA. (Oral)
33. **Manandhar, A.** and Shah, A. 2017. Techno-economic analysis of corn stover pelletization for cellulosic biorefinery feedstock transportation. ASABE Annual International Meeting 2017, July 16-19, Spokane, WA. (Poster)
34. Khanal, A., **Manandhar, A.**, Shah, A. 2017. Evaluating impacts of corn stover collection on nutrients, organic matter and soil erosion levels. ASABE Annual International Meeting 2017, July 16-19, Spokane, WA. (Oral)
35. Li, Y.Y., **Manandhar, A.**, Lu, J.X., Li, G., Zhang, X.H. and Shah, A. 2017. Life cycle assessment of value-addition to on-farm organic residues through anaerobic digestion and composting. ASABE Annual International Meeting 2017, July 16-19, Spokane, WA. (Oral)
36. **Manandhar, A.** and Shah, A. 2017. Life cycle environmental impacts of cellulosic feedstock supply in baled and pelletized formats. OARDC Annual Research Conference 2017, April 20, Columbus, OH. (Poster)
37. Li, Y.Y., **Manandhar, A.** and Shah, A. 2017. Life cycle assessment of integrated solid-state anaerobic digestion and composting for on-farm organic residues treatment. OARDC Annual Research Conference 2017, April 20, Columbus, OH. (Poster)
38. **Manandhar, A.**, P. Milindi, H. Keener, A. Shah. 2016. Techno-economic analysis of maize value chain for smallholder farmers in Tanzania. ASABE Annual International Meeting 2016, July 17-20, Orlando, FL. (Oral)
39. **Manandhar, A.** and Shah, A. 2016. Life cycle assessment of biomass densification during feedstock logistics for a biorefinery. ASABE Annual International Meeting 2016, July 17-20, Orlando, FL. (Poster)
40. Amador, I., **Manandhar, A.** and Shah, A. 2016. Life cycle assessment of corn stover fed torrefaction system. Ohio State University SROP Annual Poster Session, July 22, Wooster, OH. (Poster)
41. **Manandhar, A.** and Shah, A. 2016. Economic and environmental impacts of logistics for exported Ohio grown grains. OARDC Annual Research Conference 2016, April 21, Wooster, OH. (Poster)
42. Milindi, P., **Manandhar, A.,** Keener, H., Silayo, V. and Shah, A. 2016. An improved hermetic grain storage system for smallholder farmers in Tanzania. CFAES Annual Research Conference 2016, April 21, Wooster, OH. (Poster)
43. **Manandhar, A.** and Shah, A. 2015. Environmental and economic impacts of logistics for Ohio grown soybean exported to China. S-1041 Symposium 2015, August 10-11, Wooster, OH. (Poster)
44. Bae, C.J., **Manandhar, A.,** Riba, J., Rao, R.B., Cobb, C., Rodkin, A. and Shrader, E. 2012. Advanced battery electrode for high performance lithium-ion batteries. 2012 NASA Aerospace Battery Workshop. Huntsville, AL. 2012. (Oral)
45. Bae, C.J., **Manandhar, A.,** Riba, J., Rao, R.B., Cobb, C., Rodkin, A. and Shrader, E. 2012. Co-extrusion for advanced battery electrodes. Annual Poster Presentation. PARC, Palo Alto, CA. (Poster)

Invited talks

1. Shah, A., Baral, N., **Manandhar, A.** and Milindi, P. 2016. Cellulosic biofuels production in the United States Context. iAGRI/Sokoine University of Agriculture, April 12, Morogoro, Tanzania.
2. Shah, A. and **Manandhar, A.** 2016. Economic analysis: Parameters to be included in analysis and models. USDA-SCRI Project Initiation Meeting, January 15, Wooster, OH. (~70 stakeholders from different communities and agencies, including USDA, academicians, researchers, and specialty crop growers)
3. Shah, A. and **Manandhar, A.** 2016. Problems associated with economic analysis for specialty crops. USDA-SCRI Project Initiation Meeting, January 14, Wooster, OH. (~70 stakeholders from different communities and agencies, including USDA, academicians, researchers, and specialty crop growers)

RESEARCH GRANTS

Funded grants

1. Khanal. S, **Manandhar, A**., Witter, J., Shah, A. and Reza. T. 2022. PARTNERSHIP: Sustainable hydrothermal manure management practice to improve nutrient use efficiency for enhanced agroecosystem services. USDA NIFA AFRI. $799,996.

2. Shah, A., **Manandhar, A**., Khanal. S. and Bhoi, P. 2022. Co-firing switchgrass and waste coal in a power plant: A techno-economic and life cycle evaluation for the Ohio River Valley (SWITCH), US Department of Energy. $399,869.
3. **Manandhar, A**. and Witter, J. 2022. Hydrothermally carbonized agricultural wastes as adsorbent for minimizing nutrient runoff and improving soil quality. CFAES Research Competitive Grants Program 2022. $50,000 plus support for graduate student tuition for 6 semesters.
4. Shah, A., **Manandhar, A.** and Doan-Nguyen, V. 2021. Sustainability assessment of upcycling anaerobically digested organic waste into sustainable Na-ion battery materials for distributed power solutions. Sustainability Institute at Ohio State University. $32,875.
5. **Manandhar, A.** 2016. Ohio Agricultural Research and Development Center (OARDC) SEEDS Graduate Research Award. $5,000 for independent research work and conference travel.
6. **Manandhar, A.** 2005. GIS based modeling of land use and land cover changes in Dharan-Biratnagar industrial corridor. Research Grant for Undergraduate Thesis. $500 Grant provided by Strengthening Environment and Management at Local Level (SEAM-N), A partnership project of Government of Nepal and Finland, Nepal.
7. **Manandhar, A.**, Adhikari, A. and Karki, S. 2004. Development and testing of improved cookstoves for rural impoverished people in eastern Nepal. $1,000. Research Grant (Renewable Energy for Pro-poor) provided by Center for Rural Technology-Nepal.

Grants submitted – Not funded

1. Ely, J., **Manandhar, A.**, multiple co-PIs. 2022. Engineering Earth, A 5-Year Pilot Program to Reduce Greenhouse Gas Emissions, Increase Carbon Sequestration & Commoditize Industrial Hemp. USDA NRCS - Climate Smart Commodity grant. $100 million (Lead - Heartland Industries, $3.24 million to OSU).
2. Cornish, K., **Manandhar, A.**, multiple co-PIs. 2022. RECON: Rubber Evolution through Crop Optimization for National Security. USDA Specialty Crop research Initiative (SCRI). $11.5 million.
3. **Manandhar, A.** and Shah, A. 2021. Hydrothermally carbonized animal manure as adsorbent for minimizing nutrient runoff and mine land reclamation. Ohio State University, CFAES-New Researcher Initiative Program. $50,000.
4. Shah, A., Khanal, S. and **Manandhar, A**. 2021. A novel hydrothermal manure and nutrient management approach to improve water quality and reduce harmful algal blooms. Ohio Department of Higher Education, Harmful Algal Bloom Research Initiative. $230,664.
5. Shah, A., Khanal, S. and **Manandhar, A.,** Wicks, M., Adhikari, S. 2021. Upcycling blended corn stover and plastic waste to hydrogen fuel for combined heat and power (CHP). USDA NIFA AFRI. $1 million.

PROFESSIONAL DEVELOPMENT GRANTS

1. **Manandhar, A.** 2023. Professional Development Grant to be used toward(s) costs to attend the 2023 Annual International Meeting of the American Society of Agricultural and Biological Engineers (ASABE AIM) to be held in Omaha, NE. College of Engineering - Engineering Staff Advisory Committee. OSU. $1,000.
2. **Manandhar, A.** 2022. Staff Career Development Grant to be used toward(s) costs to attend the 2022 ASABE AIM held in Houston, TX. The Ohio State University. $1,250

AWARDS AND HONORS

Merit-based awards and honors

1. Reverend P.T. Taiganides-Professor R.E. Steward Memorial Award-FABE Graduate Student of the Year Award. 2019. Department of Food, Agricultural and Biological Engineering, The Ohio State University, Columbus, OH.
2. ASABE Educational Blue-Ribbon Awards for factsheet ‘Status of Biorefineries in Ohio’. 2018. ASABE Annual International Meeting, Detroit, MI.
3. NSF I-Corps Sites program awardee. 2016. Entrepreneurial lead for the project “Improved grain storage structure for smallholder farmers in developing countries”. University of Akron. $2,500.
4. Student grant to present research poster. 2015. S-1041 Annual Meeting and Symposium intended for brainstorming and collaborations in science and engineering for a biobased economy, Wooster, OH.

5. Swedish Scholarship for International Students to pursue graduate study (M.S.) at KTH Royal Institute of Technology, Sweden. 2008-2010.
6. Top Undergraduate Student in Agricultural Engineering. 2006. Tribhuvan University, Nepal.
7. National Engineering Excellence Scholarship. 2001-2005. Meritorious government scholarship to pursue undergraduate education at Institute of Engineering, Tribhuvan University, Nepal.

Awards for presentations and papers

1. Second position in poster competition under 'Research Staff' category. 2023. CFAES Annual Research Conference for poster: **Manandhar, A.**, Dami, I. and Shah, A. 2023. Techno-economic analysis of using biomass mulches for winter protection of vineyards in Ohio. Ohio State University CFAES Research Conference 2023, April 27-30, Columbus, OH.
2. Third position in poster competition under 'Postdoctoral researcher' category. 2021. CFAES Annual Research Conference for poster: **Manandhar, A.,** Khanal, S., Shah, A. 2021. Techno-economic analysis of implementing unmanned aerial systems for corn crop health monitoring. CFAES Annual Research Conference 2021, April 8. Virtual Conference.
3. Second position in poster competition under 'Research Staff' category. 2021. CFAES Annual Research Conference for poster: Shrestha, E., **Manandhar, A.** and Shah, A. 2021. Life cycle assessment of spinach grown in an urban farm in Mansfield, Ohio. CFAES Annual Research Conference 2021, April 8. Virtual Conference.
4. Second position in poster competition under 'Professional Researcher' category. 2020. The Ohio State University Plant Sciences Symposium for poster: **Manandhar, A**., Zhu, H., Ozkan, E. and Shah, A. 2020. Techno-economic impacts of laser-guided variable-rate pesticide application for maintaining the health of nursery crops. Ohio State University Plant Sciences Symposium 2020.
5. First position in poster competition under 'Postdoctoral researcher' category. 2020. CFAES Annual Research Conference for poster: **Manandhar, A.** and Shah, A. 2020. Techno-economic and life cycle analyses of biobased lactic acid production. CFAES Annual Research Conference 2020, April 24, Columbus, OH.
6. Scientific Publication Award. 2018. Department of Food, Agricultural and Biological Engineering, The Ohio State University, Columbus, OH.
7. Graduate Research Award, 'Ph. D.' category. 2018. Department of Food, Agricultural and Biological Engineering, The Ohio State University, Columbus, OH.
8. Third position in poster competition. 2018. Plant Sciences Symposium at The Ohio State University, Wooster, OH for poster: **Manandhar, A.,** Zhu, H., Ozkan, E. and Shah, A. 2018. Evaluating techno-economic impacts of using conventional sprayer retrofitted with intelligent control functions for pesticide application in apple orchards. Plant Sciences Symposium at The Ohio State University 2018, April 6-7, Wooster, OH.
9. Scientific Publication Award. 2017. Department of Food, Agricultural and Biological Engineering, The Ohio State University, Columbus, OH.
10. Third position in poster competition under 'Ph. D.' category. 2017. OARDC Annual Research Conference, Columbus, OH for poster: **Manandhar, A.** and Shah, A. 2017. Life cycle environmental impacts of cellulosic feedstock supply in baled and pelletized formats. OARDC Annual Research Conference 2017, April 20, Columbus, OH.
11. First position in poster competition under 'Ph. D.' category. 2017. OARDC Annual Research Conference, Columbus, OH for poster: Li, Y.Y., **Manandhar, A.** and Shah, A. 2017. Life cycle assessment of integrated solid-state anaerobic digestion and composting for on-farm organic residues treatment. OARDC Annual Research Conference 2017, April 20, Columbus, OH.

REVIEWER EXPERIENCE

Journal papers: Applied Sciences, Energies, Journal of American Society of Agricultural and Biological Engineers, Journal of Cleaner Production, PLOS ONE, Scientific Reports.

Paper and research grants competition

- ASABE, K. K. Barnes Student Paper Competition Review Committee 2022, 2023
- Foundation for Food and Agriculture Research (FFAR), Seeding Solutions Grant 2022, 2023
- The Ohio State University, SEEDS Graduate Research Award Review Panel 2017, 2018

- The Ohio State University, Hayes Graduate Research Forum 2019 - 2022

AFFILIATIONS

- American Society of Agricultural and Biological Engineers (ASABE) 2015 - present
- The Ohio State University, Engineering Graduate Ambassadors 2015 - 2018

PROFESSIONAL SOCIETY SERVICE

- Vice-chair, 2022 - present. PRS-280 Bioconversion and Bioprocesses Committee, ASABE
- Organizer and Moderator. 2023. 'Biomass Feedstock Supply Logistics and Modeling', Oral Technical Session. ASABE AIM 2023
- Committee member. 2022 - present. P-123 K.K. Barnes Undergraduate Paper Competition Committee, ASABE
- Committee member and Liaison. 2016 - present. ES-220 Biobased Energy, Fuels, and Products, ASABE
- Committee member and Liaison. 2017 - present. MS-23/7/2 Forage & Biomass Engineering Committee, ASABE
- Committee member. 2023 - present. ASE-16 Sustainability Committee, ASABE
- Member. 2023 - present. Work group for 'Pioneer methods, metrics, and standards for advancing circular bioeconomy systems', ASABE Circular Bioeconomy Institute

STUDENT MENTORSHIP EXPERIENCE

Mentored graduate, undergraduate and high-school students, and summer interns on their thesis and projects.

- Sandeep Dhakal, M.S. Student 2022 - present
- Esha Shrestha, M.S. Student 2022 - present
- Matthew Lorentz, Summer Intern 2022
- Shyam Sivaprasad, M.S. Student 2019 - 2021
- Asmita Khanal, Ph.D. Student 2018 - 2022
- Asmita Khanal, M.S. Student 2016 - 2018
- Andrea Landaverde, Intern 2017
- Isamar Amador Diaz, Summer Research Opportunities Program (SROP) Intern 2016
- Suren Gourapura, Summer Intern 2016
- Arthur Fontana, Summer Intern 2016
- Paschal Milindi, M.S. Student 2016
- Christian Höcker, Intern 2013
- Believe in Ohio E-STEM Forum for high-school students 2016

DIVERSITY, EQUITY AND INCLUSION ACTIVITIES

- Member of the Executive Committee. 2022 - 2023. The Ohio State University. Celebration of Nations. Annual event celebrating the diversity of the students representing more than 30 countries.