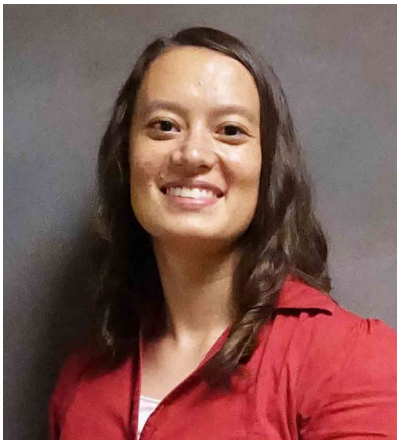

Jennifer Rackliffe is from Colorado Springs, Colorado, and completed her B.S. in Chemical Engineering at Brigham Young University in 2017. After a brief internship with a private company, she joined Purdue ABE in 2018 in the Laboratory of Renewable Resources Engineering (LORRE), working with Dr. Nathan Mosier and Dr. Jiqin Ni. She is interested in renewable energy and sustainable waste treatment processes. Jenny is active on the ABE GSA board, serving as philanthropy chair, secretary, and now recruitment chair. She is the recipient of the Purdue Andrews Fellowship and the National Science Foundation Graduate Research Fellowship. Following graduation with her M.S., she plans to remain at Purdue ABE to pursue a doctoral degree. Jenny met her husband, Riley Rackliffe, while studying at Purdue. In her free time, Jenny enjoys spending time with family and friends, serving in her church, gardening, running, swimming, hiking, and exploring outside.

Agricultural & Biological ENGINEERING

Thesis Defense

Speaker: Jennifer A. Rackliffe

Title: Effect of Acclimatization Rate on Biogas Production from Anaerobic Digestion of Biodiesel Waste Products

Major Professor: Dr. Nathan S. Mosier

Date: Tuesday, July 07, 2020

Time: 1:30 PM

Link to join: Zoom

Abstract:

Anaerobic digestion can be used to sustainably treat the organic byproducts of the biodiesel process (crude glycerol and biodiesel wastewater) while generating a renewable natural gas to be used for heating or electricity generation. This thesis (1) investigated the possibility of co-digestion of biodiesel byproducts without use of external substrates or pretreatment and (2) assessed the impact of various acclimatization rates on the stability and efficiency of such a system. Two inocula (effluent from a wastewater treatment plant digester and from an agro-industrial waste digester) and two acclimatization rates were studied. Co-digestion of crude glycerol and biodiesel wastewater at high organic loading rates (up to 6.8 g COD L^{-1} day^{-1}) is possible without addition of other substrates or pretreatment. The cumulative biogas production of the digesters using inoculum from the agro-industrial waste digester was statistically greater than the digesters using the wastewater treatment plant digester, indicating that similar inoculum could be useful for additional experiments. In addition, maximum efficiency due to a slower rate of acclimatization was higher for both inocula, up to a maximum average daily biogas yield of 621 mL biogas g^{-1} COD added.

Application:

The biodiesel industry produces toxic waste as a byproduct. Anaerobic digestion can break down those toxic byproducts and simultaneously produce renewable natural gas. This process reduces greenhouse gas emissions, neutralizes toxic waste, and provides economic benefit from the byproducts.