Introduction

The first usage of algae for wastewater treatment was reported in 1966, but recently there is a growing interest on using wastewater and microalgae for biofuel production (DOE, 2018).

- **High-Rate Algal Ponds (HRAPs)** are an engineering design for Maximum algal biomass production
- **Biomass Yield (BY)** Calculation: Direct Microalga (g/m²/day)
- **Life Cycle Assessment (LCA),** a technique to assess environmental impacts associated with all the stages of a product’s life, is used in this research.
- Previous LCA studies only focused on a single site with generalized assumptions, without systematic consideration of geographic diversity, seasonal climate variation, and resource availability.

**Objectives & Significance**

Some of the main objectives are:

- Evaluate the Potential of Wastewater Algal Biofuel as Point-by-Point Analysis in the National Scale
- Develop a High-Resolution-Spatially-Explicit Life Cycle Assessment (HRSE-LCA) model

The significance of this research are:

- Evaluate seasonal and geographic variations in environmental impacts of wastewater-based algal biofuels
- Introduce a methodology that could be used for spatially explicit analysis of algal biofuel integrated with wastewater on macro-scale in any other regions as well

**Results**

- No Energy Efficiency on scenario 1

**Discussion**

A comprehensive analysis of algae cultivation was performed in this research. The results indicate that using wastewater for algae cultivation is both economically and environmentally promising for 42% of total biofuel capacity in the US.

- Hydrothermal liquefaction is the most promising scenario.
- Yearly production of bio crude oil in wastewater is around 0.5 billion gallon, about 0.8% of total crude oil and 5% of biofuels produced in the US.
- This result indicates that land availability or land use efficiency are limiting factors for algal cultivation that have not been considered in previous studies.
- To understand the full potential of algal biofuel, future research should be done to investigate the potential of algal biofuel with other resources including sea water and brackish water.

**References**

7. Data from USGS and NOVA and NREL.