ABO Recommends Lifecycle Analysis of Algal Production Systems

Algae's role in energy security, climate, and sustainability: Industrial algal production for biofuels and other products could advance a variety of important policy objectives. It would enhance energy security, reduce anthropogenic greenhouse gas ("GHG") emissions, advance renewable energy development and advance other sustainability objectives, including water quality, water use efficiency and nutrient recycling via wastewater utilization.

Mechanisms for mitigating anthropogenic GHG emissions with algal systems: The diversity of potential algal products and production systems suggests a variety of possible mechanisms for mitigating anthropogenic GHG, including:

1) Algal fuels will directly displace fossil alternatives;
2) Algal fertilizers will reduce GHG-intensive production of conventional nitrogenous fertilizers;
3) Algal animal feeds will reduce emissions via effects associated with indirect land use change;

The diversity of potential algal-derived compounds suggests that industrial algal development may yield additional products and processes that provide novel opportunities for GHG mitigation.

Application of Lifecycle Assessment (LCA) to algal systems: LCA protocols, such as ISO 14040:2006, have been developed previously and implemented in assessment tools. However, the algal industry is expected to incorporate novel process elements that have not been well characterized and that will require development of new lifecycle analytic methodologies. These novel elements are expected to fall within the industrial segments of cultivation, harvest and valorization (upgrading to value-added products), which are the focus areas of the ABO for LCA. As such, the Algal Biomass Organization recommends strongly the development of data collection reporting protocols and LCA methodologies for these unique, industry-specific processes.

Key Algal GHG Parameters: ABO recommends that the parameters identified in the table below be characterized for effective analysis of lifecycle impacts to GHG emissions from algal cultivation, harvesting, and valorization processes, recognizing that comprehensive LCA's will also examine other types of impacts (e.g., to air quality, water quality, and ecological systems). Methods for definition of potential land use impacts/benefits are in need of additional development.

Recommended parameters for evaluating GHG impacts from algal production systems		
Product-specific	**Process-specific**	**Land-conversion**
• Direct substitution effects • Indirect substitution effect	• CO_2 feedstock to growth systems • Growth system off-gassing • Operational atmospheric vents • GHG's embodied in process inputs • GHG's from construction & de-commissioning	• Direct or indirect land-use change

Role of Public Investment: Public investment will substantially accelerate the development of these recommended protocols and methodologies, and their implementation within broader lifecycle analytic frameworks. Such investment appears appropriate in light of the important roles public funding has played in developing similar analytic capabilities for other technological routes to the policy objectives identified above.

The Algal Biomass Organization can advance development of lifecycle analytic capabilities by providing a forum to collect and disseminate information. This will help its members coordinate related efforts to develop the requisite protocols, methodologies and technical standards.

ABO Technical Standards Committee www.algalbiomass.org/committees/technical-standards
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