

Advancing Algae for Animal Feed (A³F)

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Public Abstract:

Algae are a diverse group of phototrophic organisms that can be applied for a diverse array of agricultural products from soils to animal feed. Research has shown that using algae as a supplement or feed replacement (up to 20% of the animal's diet) can beneficially improve the health and quality of animals and their products. As the algae industry continues to expand, the number of commercially viable strains will continue to increase. In particular, the Department of Energy has developed a broad portfolio of viable algae strains that may have potential as an animal feed additive. We propose to utilize *in vitro* and *in vivo* experimentation with multiple algae species to effects on enteric CH₄ release and the biodegradability of the cellular material. We will investigate *Tetraselmis striata*, *Spirulina (Arthrospira platensis)*, *Chlorella vulgaris*, and *Ulva* sp.

We will cultivate in 100-m² raceways at AzCATI to compare sumps, which increase residence time, and membrane carbonation, which allows for bubbleless CO₂ transfer as two documented methods of increasing carbon transfer efficiency (CTE). We will complete a matrix of abiotic tests to better quantify the CTE of each technology on synthetic industrial CO₂ sources ranging from natural gas combustion (4-8% CO₂) through direct air capture and fermentation gases (80-100%). We will also complete 2 30-day trials, one with 4% CO₂ and the other with 80-100% CO₂ to evaluate the carbon and nitrogen utilization efficiency in cultures. This data will be used to validate the techno-economic and life cycle assessment modeling that has been done by Colorado State University.