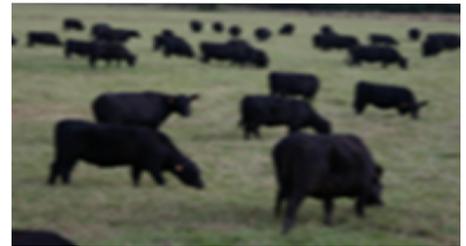


## Optimizing Coproduct Utilization: Adding Value to Algal Biofuels

Algae-derived lipids offer tremendous potential for conversion to biofuels at commercial scale. Significant development of this technology is ongoing, including cultivation, harvest, and refining practices. However, most models suggest that cost of fuels generated from these processes cannot compete with petroleum refining. An additional issue is the quantity of **post-extraction algal residues** (PEAR): for each billion gallons of algal biofuels generated, 4 to 5 million tons of PEAR will be produced. This “waste” stream could be a major cost burden, environmental challenge, or the key to enhancing profits from biofuel generation. Animal feeding systems, including domestic livestock and mariculture systems, are well-documented consumers of coproducts. Recent economic analyses indicate that the value of PEAR for livestock, fish, and shrimp feed systems has potential to be equal to that of the derived lipids from algae, resulting in commercialization of algae production of derived lipids for biofuels. Additionally, these systems can absorb large quantities of feedstuffs. For example, United States feed grain consumption is ~350 million tons per month, or 4.2 billion tons per year. Production of 50 billion gallons of algal biofuels annually would produce PEAR equivalent to just 4.75% of the U.S. feed grain market, not counting the use of other feedstuffs. Further, the farming of shrimp and fish is growing at an annual rate of more than 8%. As a comparator, these markets already absorb a coproduct stream from biofuel generation—corn distillers grains—equivalent to ~20% of total feed grain use. Potential value of PEAR ranges from \$180 to \$1,600 per ton, depending upon application and ultimate nutritive value.



### Utilization of Algae Byproducts for Animal Feeding Systems

- Creating value-added coproduct streams from the production of biofuels
- Ready market for quality coproducts, with large volume and existing infrastructure
- Multiple submarkets and specialty products within the larger market
- Valuation of product definable based on its nutritive performance
- Utilization of most coproducts (PEAR, glycerin)

### Impact Statements

- Demonstrate PEAR use in animal feeding systems, establishing a very large predictable market.
- Show that the economic value of PEAR is approximately equal to that of derived oil from algae, making production of algae commercial and profitable.
- Make commercial production of algae sustainable and environmentally friendly by demonstrating that PEAR can be used in animal feed systems with high value.
- Make production of cattle, swine, poultry, shrimp, and fish more profitable and sustainable, resulting in lower-cost animal protein for mankind.

Texas AgriLife Research and Texas A&M System are uniquely positioned to address challenges associated with developing PEAR into a value-added product stream for biofuels refiners. Faculty experts in livestock and aquatic feed and nutrition provide the requisite knowledge base and experience to address these issues. Our research models and physical assets are designed to solve problems associated with livestock and marine animal feeding systems. The facilities for livestock, shrimp, and fish feed and nutrition research in the Texas A&M University System are the finest and largest in the world.

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