

Displacement Estimation of Biofuel Co-products for Life Cycle Environmental Performance Analysis in California

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Background

Objectives:

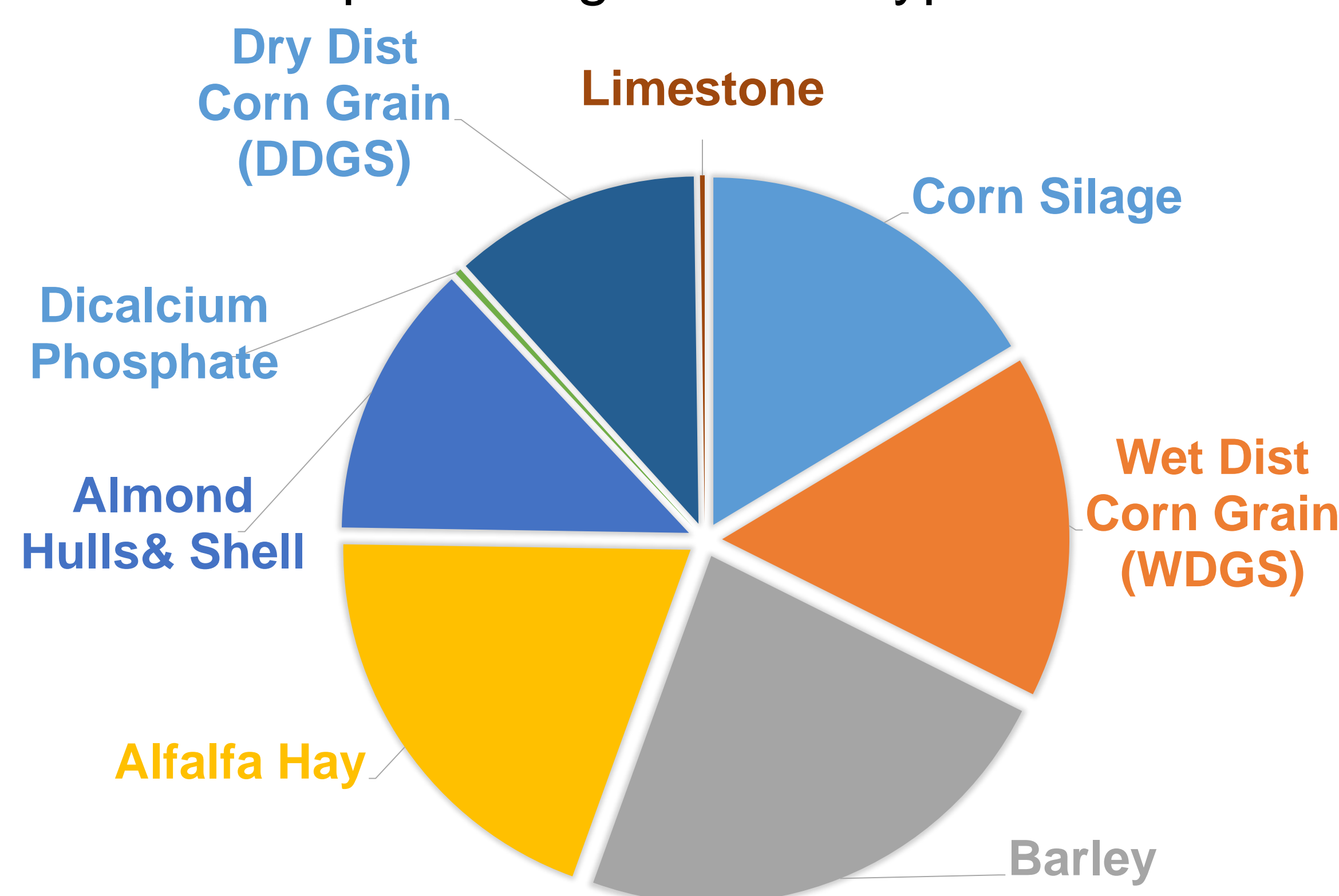
- (1) To evaluate the performance of two biofuel co-products as dairy cattle feed in California; and,
- (2) To assess the displacement credit of the two co-products as feed.

Biofuels and Co-products

- Biofuel production systems produce multiple co-products or by-products.
- Livestock feed is a major application for many co-products from biofuel production systems.
- Co-products are critical for determining biofuels' performance in LCA and in LCA-based policies such as LCFS.

California Situation

- The largest milk production state
- Large agriculture market provides a variety of fodder crops and agricultural byproducts



DEFAULT DAILY FEED RATION OF DAIRY CATTLE (CA)

Approach

- Understand feeds used for dairy cattle in California.
- Conduct life cycle inventory assessment of California feedstuffs.
- Calculate feeds displaced by biofuel co-product using a feed ration calculator (PCDairy).
- Estimate life cycle GHG emissions and energy consumptions displaced by co-products for biofuel production.

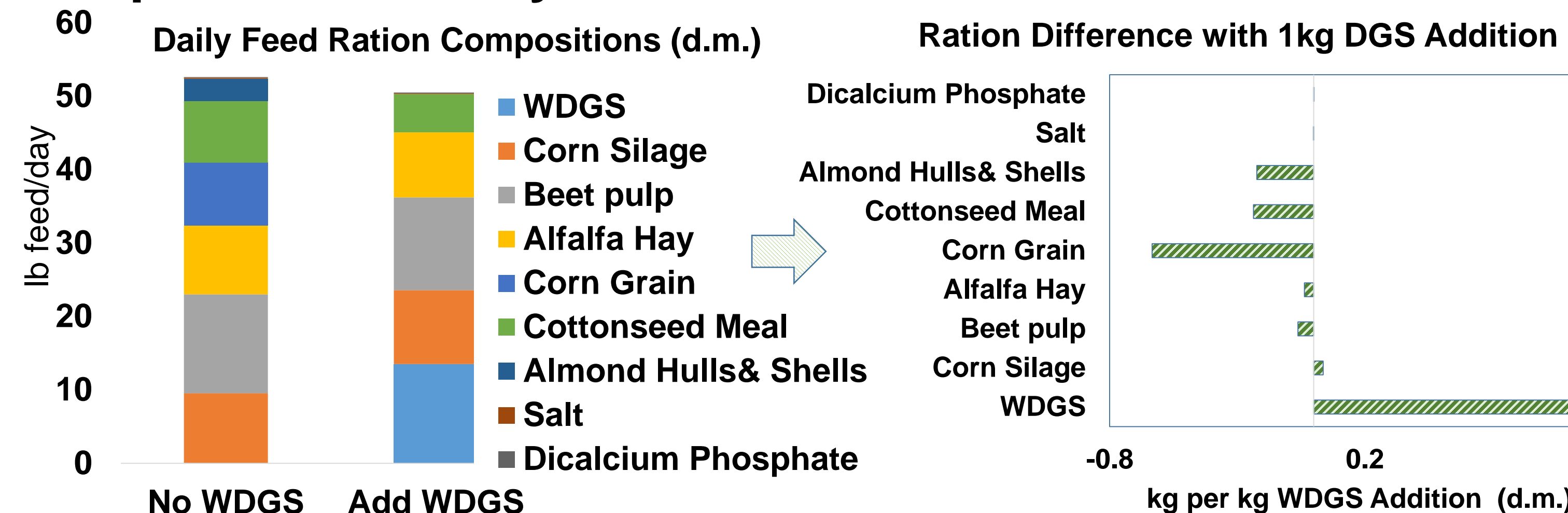
Displacement Estimation

Two Co-products Studied:

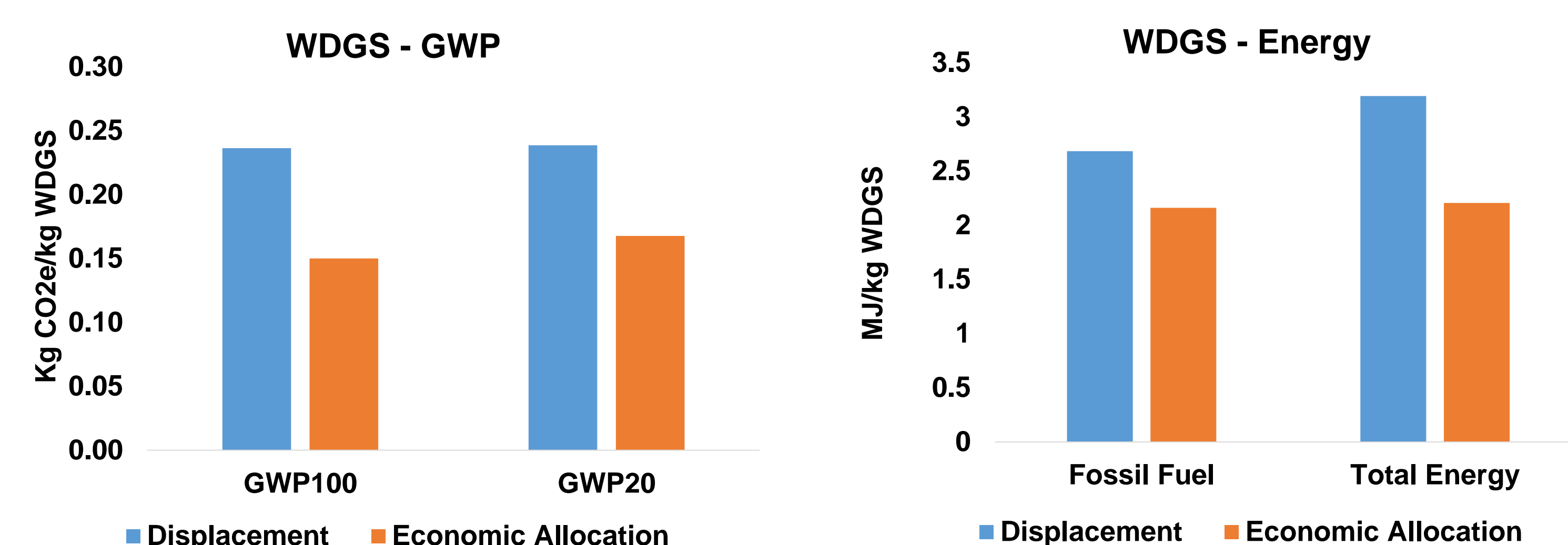
Wet distilled grains and solid (WDGS): the co-product from corn ethanol production facility and is primarily used as animal feed.

Algal Cake: the microalgae biomass residual after lipid extraction.

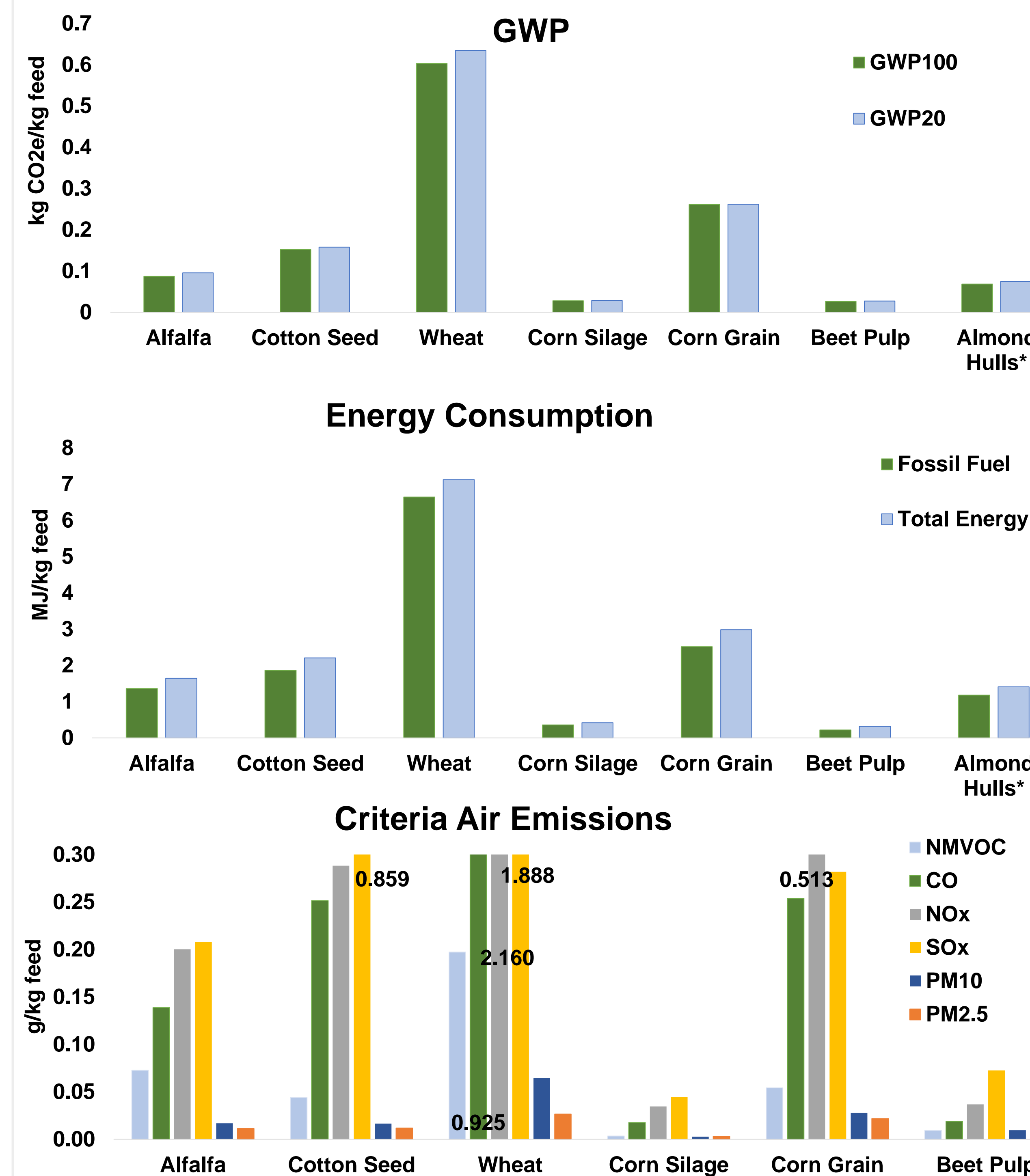
Displaced Feeds by WDGS



Comparison of displacement and economic allocation

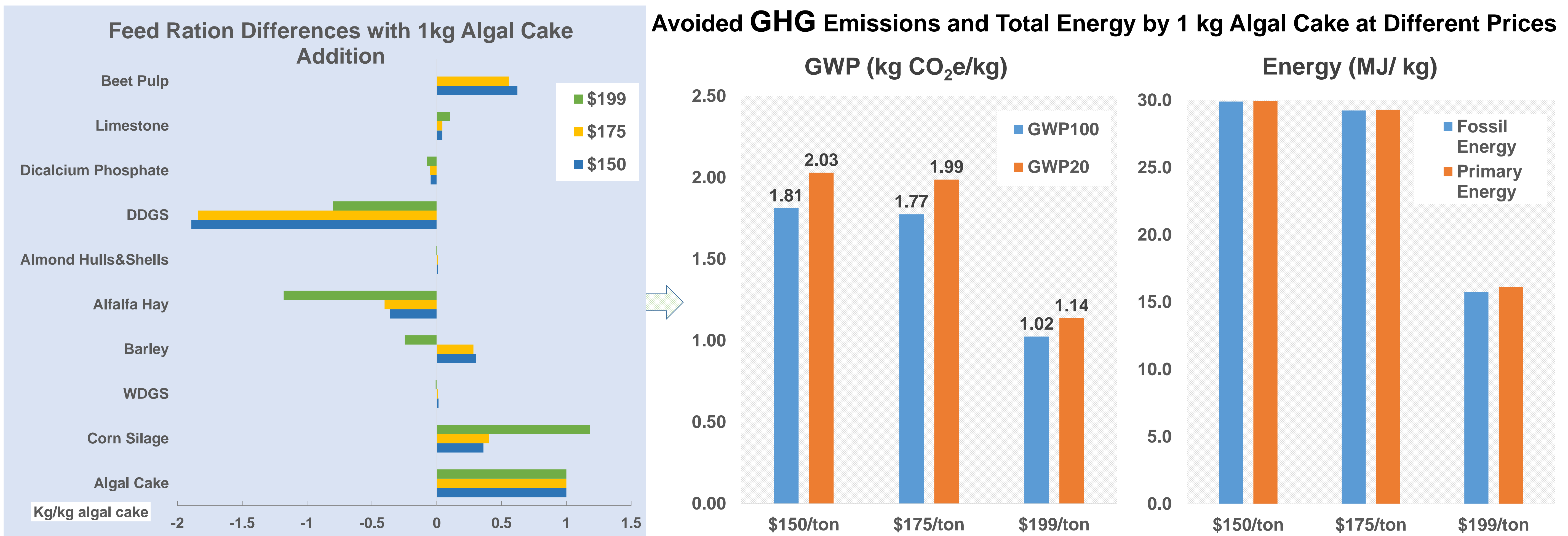


LCI Results of California Feeds



*LCI of California almond hulls and shells production was adopted from Kendall et al. 2015

Price Impacts on Displacement Results (Algal Cake)



Contact the Authors!

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