What's Worth More: A Cow's Milk or its Poop?

Aaron Smith
DeLoach Professor of Agricultural Economics
UC Davis

Email: adsmith@ucdavis.edu
Website: https://asmith.ucdavis.edu
Ag Data: https://asmith.ucdavis.edu/data
Ag Data News Blog: https://agdatanews.substack.com/

Two Sources of Methane from Dairy Cattle

Enteric Fermentation

- Microbial fermentation in the rumen produces methane

Manure Decomposition

- Anaerobic lagoons are the least-expensive way to handle manure in concentrated dairy operations
  - Anaerobic decomposition produces methane
  - Digesters capture methane ✔
  - Captured gas can be used for transportation place of fossil gas ✔

- **Equal emissions** from the two sources if manure processed in lagoons

Two Government Programs Give Credit for Capturing Methane in Digesters

Federal Renewable Fuel Standard (RFS)

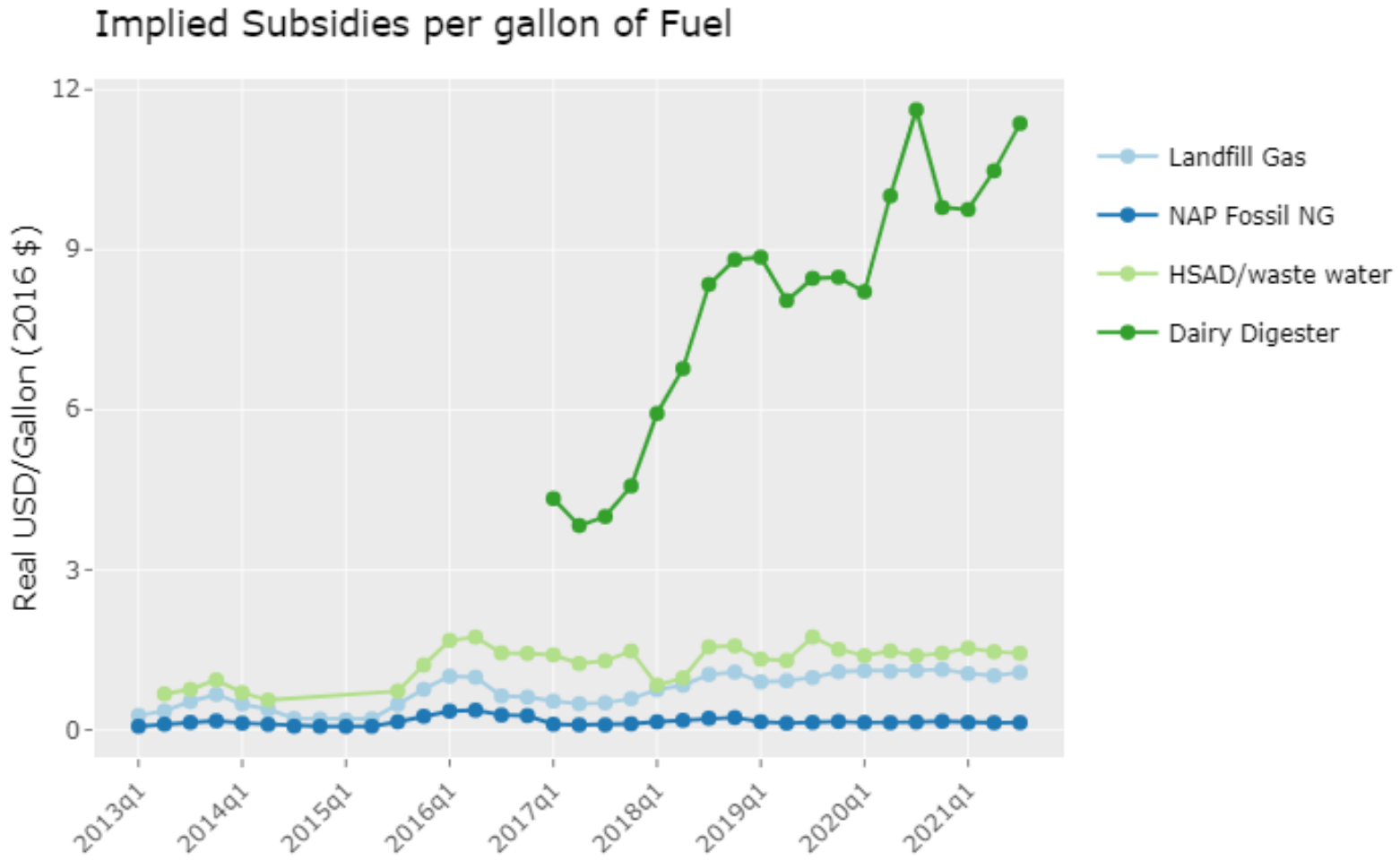
- Subsidy per MMBTU depends on price of RIN credits

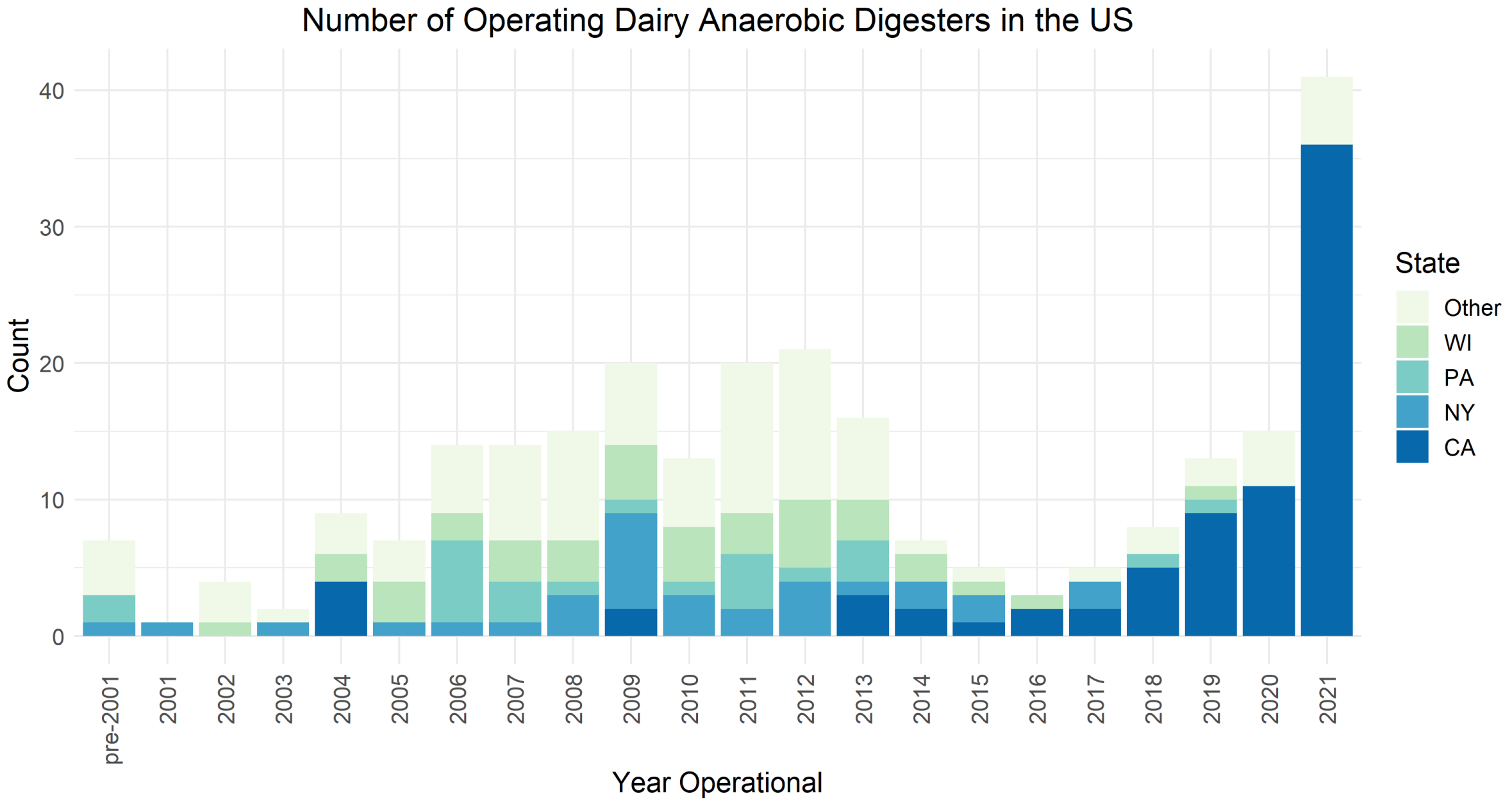
CA Low Carbon Fuel Standard (LCFS)

- Subsidy depends on price of LCFS credits and estimated carbon intensity

In addition, various grant programs contribute to capital costs of digester projects

LCFS subsidies were large through 2021





Source: EPA Agstar database

RFS and LCFS Subsidies are Thousands per Cow

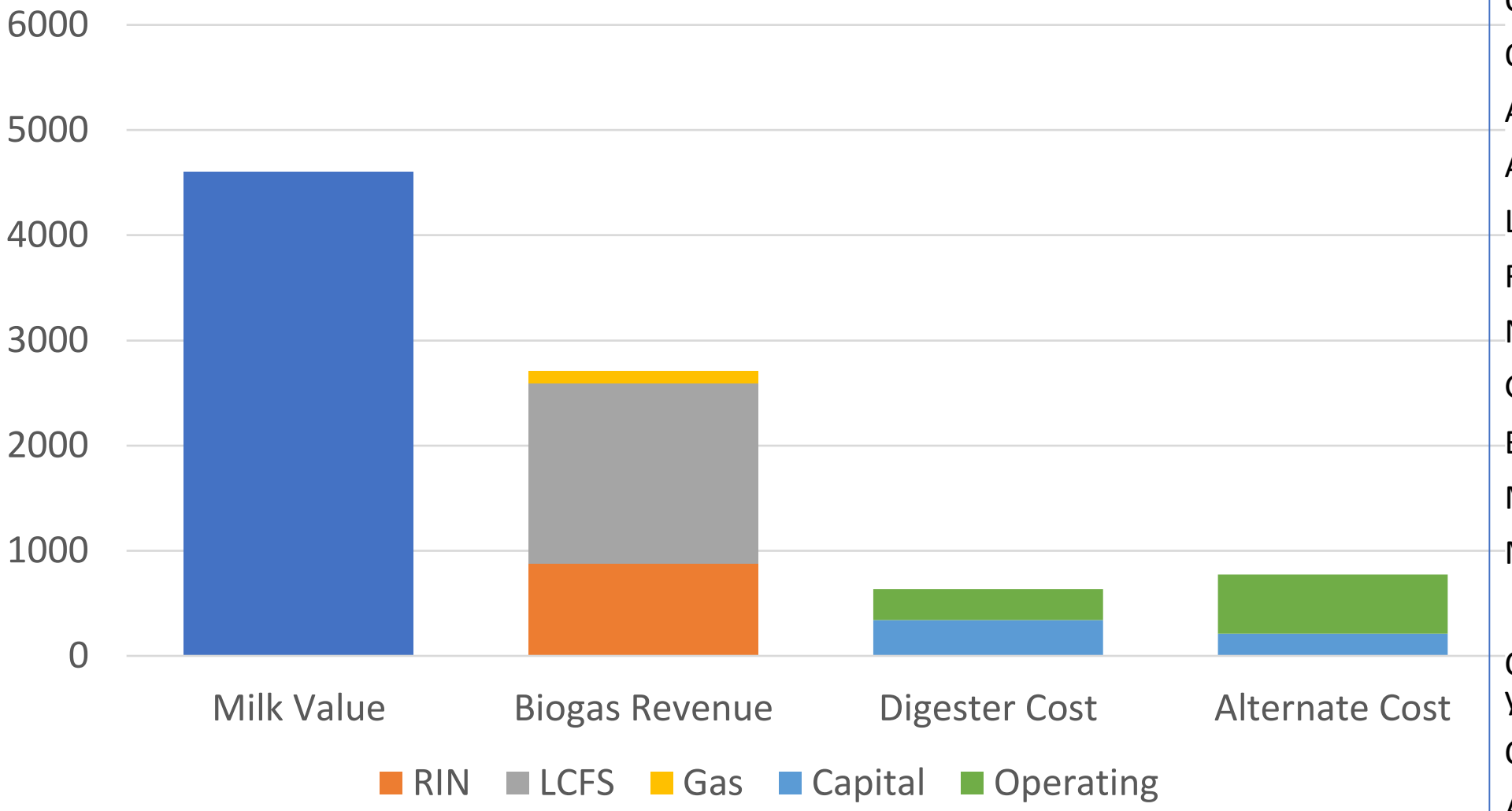
	Market Prices			Subsidies	
	Nat Gas $/MMBTU	RIN $/gal	LCFS $/MT	RIN $/cow	LCFS $/cow
2021 Q3	5	3.00	185	877	1716
Today	5	3.10	115	906	1063

Assumptions

Biogas CI = -300

Biogas production = 22.5 MMBTU/cow

What Was Worth More in 2021 Q3?



Assumptions

Herd size = 2000 cows

Discount rate = 0.07

Capital cost = $4.8m

Operating cost = $294/cow

Alt cap. cost = $3m

Alt op. cost = $563/cow

LCFS price = $185/MT

RIN price = $3.00/gal

NG price = $5/MMBTU

Gas prod = 22.5 MMBTU/cow

Biogas CI = -300

Milk prod = 230 cwt/cow

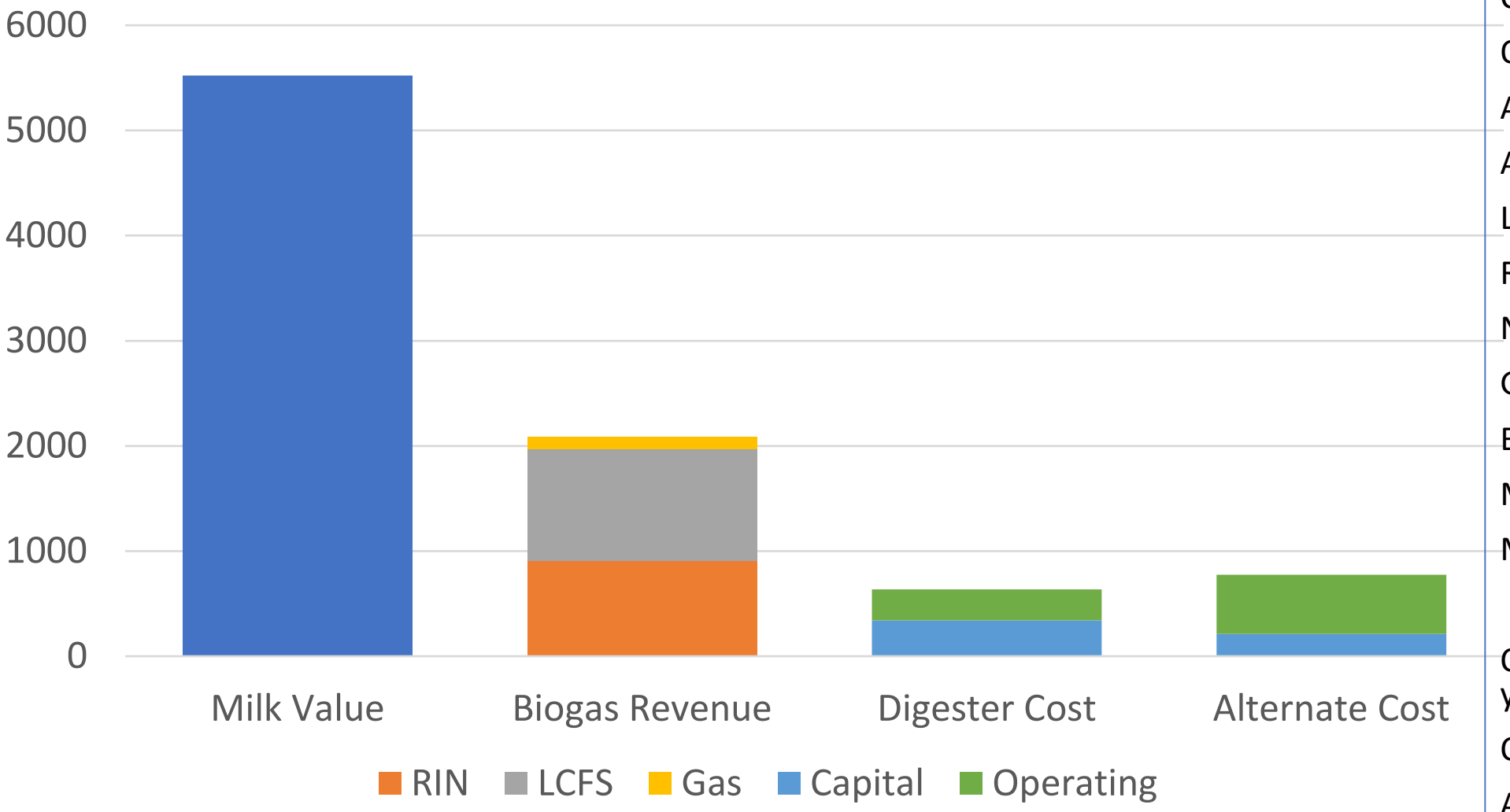
Milk price = $20/cwt

Capital cost amortized over 10 years

Costs from my blog

Alt. costs from Myers Jaffe (2015)

What's Worth More Today?



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Biogas CI = -300

Milk prod = 230 cwt/cow

Milk price = $24/cwt

Capital cost amortized over 10 years

Costs from my blog

Alt. costs from Myers Jaffe (2015)

Conclusions

- LCFS and RFS subsidies are large – will farmers begin to farm methane rather than milk?
- Incentives for further intensification of beef, dairy, and hogs throughout the country
- LCFS credit price might go up again