

Nutrient Recovery within an AD Platform: Partitioning of Nutrient Streams and Production of Value-Added Products

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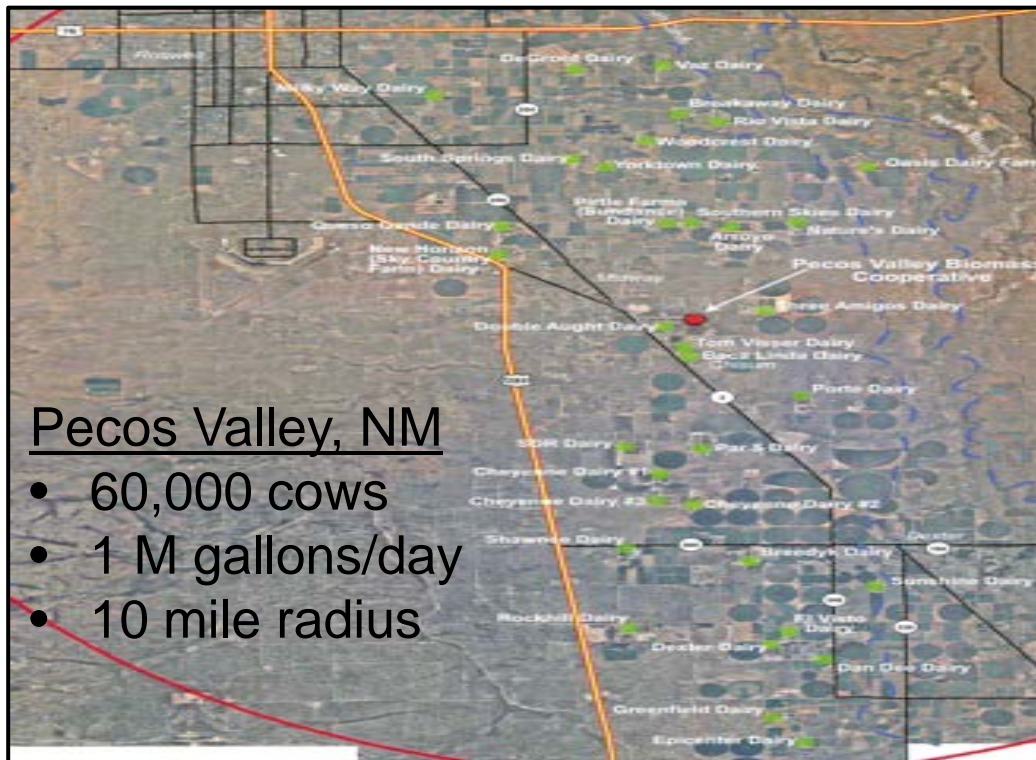
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Concentrated CAFO Regions

Due to expense of transporting liquid manure, soils nearby to *some* CAFOs have become over-burdened with phosphorus, nitrogen, and/or salts (USDA APHIS, 2005). *Some* regions now report levels in excess of national and state standards for ***PM 2.5 air quality, surface P, and groundwater nitrate.***



- Chesapeake Bay
- Mississippi River Valley
- Pecos Valley, NM
- Columbia Basin, WA
- Central Valley, CA
- Magic Valley, ID

Take Home Message

As opposed to simply transforming a portion of organic nutrients to more bio-available inorganic form (present sales pitch), ***a paradigm shift is required—nutrients must be removed from the area.***

This can only be done by ***concentrating and partitioning a portion of the nutrients through active nutrient recovery processing.***

Thus, ***next-generation AD must be a combination of AD and nutrient recovery***; it is through this combination that serious nutrient threats are minimized and AD adoption is accelerated. ***Not AD for power, AD for environmental control, which also makes power.***

Must have a viable business plan: must be able to provide ***cost-effective technologies with viable markets and policy incentives.***



30 tons N-Ammonia/year
(30% loss)

Co-Digestion (30% volume)
\$210,000 + \$173,000 + \$150,000/year
(assume tipping fee, 2x biogas, 2x N, 1x P)

\$173,000/year @ \$0.08/Kwh

60 ft³ CH₄/cow day

11 M gallons/year

- 170 tons N/year
- 30 tons P/year
- 80 tons K/year

1,000 Cow Scrape Dairy
(30 gallons/cow day)

S/L

115 tons N/year
 25 tons P/year
 75 tons K/year

3,400 tons fiber/year
 @70% moisture

\$34,000/year @ \$10/ton

Install nutrient recovery technology

70% NH₃; 80% P; 20% K Recovery (~6:1:6)

Use Existing Lagoon Water (~2:1:2)

Option 2

Option 1



Agronomic application to 640 acres alfalfa
 (25 and 180 pounds P and N/acre)



70 tons N-Fertilizer & 25 tons P-Fertilizer
(\$150,000 + \$85,000/year)
 (at \$450/ton AS & \$50/ton P-solid)

Agronomic application to 1,250 acres corn
 (160 pounds/acre at 2:1:2)



Export 56%, 83%, and 25% of N, P, K, respectively. Nutrient co-product sales at 1.6x the electricity. Halve the number of acres and fuel to apply lagoon water. More effectively use nutrients on field.

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