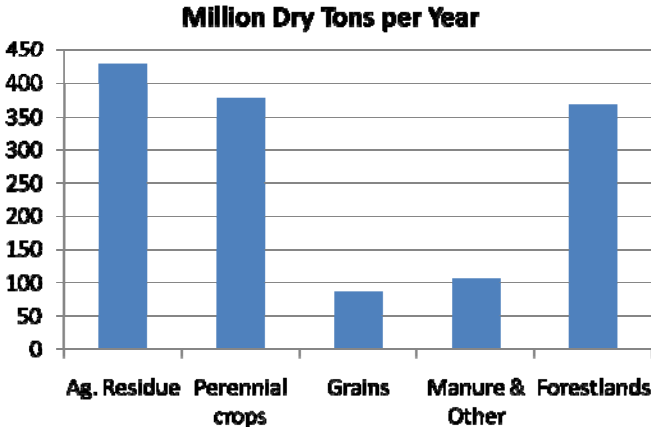


# Animal Waste to Energy Economics

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Animal Waste is not the Largest Source of Biomass ...  
but among the least expensive



Source: "Billion Ton Study"





Broilers and Turkeys  
are raised on dry litter

*“Fibrowatt announces plans for 2 power plants in North Carolina with a 3<sup>rd</sup> being considered.”*

The first is a 55 Mw plant.

The second is a 40 Mw plant costing \$190 million.  
It will burn 500,000 tons of litter per year.

Motivations include North Carolina’s RPS  
And restrictions on land application of P.

These contribute to higher long term electricity  
sales rates and lower market values for litter as a  
fertilizer

**We weigh economies of scale in generating capacity against increasing costs of feedstock collection and by-product dispersal.**



*Broiler operations tend to be located in a 30 mile radius of a processing plant and feed mill.*

*Texas really has the bull by the horns*

**Panda Ethanol Inc in Hereford TX**

**Designed to gasify 1500 tons of cattle feedlot manure per day**

**Syn Gas is burned to heat steam that provides all the heat for a 115 million gal/year ethanol plant**

**WDGS from plant goes to feedlots to feed cattle**

Dry litter and dry manure are energy dense and conducive to transport and to burning or gasification.

Issues are raised about emissions and about the destruction of renewable nitrogen fertilizer. Screening may recover some nutrients.



Liquid or Slurry manure management systems are more common for pigs, dairy cattle, and egg layer operations.

Liquid manure is more conducive to use on site with anaerobic digestion and land application of water and nutrients.



Example

A new earthen digester  
With cover  
And partial aerobic treatment

Estimated cost  
\$80 to \$90 per year  
per 1000 pounds Steady State  
Liveweight (about 7.4 head  
finishing capacity)  
(NCSU Animal and Poultry Waste  
Management Center)

Benefits: methane capture and  
flaring eligible for Carbon Credits,  
Excess water control, odor control



Example

120 KW generator set  
Tie to Grid  
Controls

Estimated cost: \$0.17/kwh

Limitations:  
Oversized,  
Non-continuous operation  
Excessive repair and downtime

NC govt. program allows  
payments up to \$0.18 /kwh  
Will allow improved design and  
operation

### **Economic Issues re. Anaerobic Digestion and Biogas Use**

**Economies of scale are substantial  
... larger farms, centralized systems are lower cost per unit**

**Ambient temperature systems may be least expensive but  
have large seasonal swings in gas production making  
energy use more challenging**

**Regulations make small engines difficult to operate in  
compliance.**

**Water and nutrients are more valuable now**

### **Energy from Manure in the South**

*“...a whole lotta shakin’ going on”*