



# Livestock Feeding in the Bio-Energy Era

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### **Estimated corn use by Iowa livestock (2006)**

2006 Iowa Livestock	Count	Corn Use	
	(1,000 hd)	(bu/hd)	(million bu)
Grain-fed cattle	1,332	60	79.9
Dairy cattle	210	168	35.3
Market hogs	32,911	10.3	339.0
Breeding pigs	1,855	17.1	31.7
Layers	58,455	0.86	50.3
Other (beef cows, sheep, turkeys, death losses)			70.4

**est. 606,678,660 bu of corn to feed IA livestock (2006)**



## Reference Point: 2006

- Iowa corn crop, 2 billion bu.
- Corn use Iowa livestock, 0.6 billion bu.
- ~30% of corn in IA fed to livestock
- ~18% of corn in IA fed to pigs
- ~60% of corn fed in Iowa fed to pigs

Note... estimate assumes no DDGS use



# Cornstarch to ethanol

- Co-products can easily be fed to ruminants...
- As a nutritionist I'm not worried about cattle as long as we have access to co-products with nutritional value
- Pigs and poultry???



# Reducing corn use by pigs

- 9 different diet formulations
- 4 proven
- DDGS, crude glycerol, animal fats
- 5 theoretical
- Combinations of above plus fractionated co-products



# Reducing corn use by pigs

At growth and performance levels we are accustomed to

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1. We can reduce corn use by 25% by using co-products (7.7 bu/hd)
  2. We may be able to reduce corn use by 45% (5.7 bu/hd)

## Other approaches

- Optimal feeder adjustment 4-6%
- Limit fed pigs 3-7%
- Pellet diets 5-6%

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- Aggressively cull sub-par animals 2-5%
- Genetic selection 2-4%
- Feed intact boars 7-11%

Additive effects of adopting multiple strategies are unknown



# Feeding corn to pigs

If pigs are going to be raised, they will be fed significant amounts of corn...

Unless...

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1. Producers accept slower growth rates
2. Pork processors and consumers accept different carcass characteristics
3. Feed energy sources independent (mostly) of global energy demand and land distribution utilized

# Crop-Livestock Synergy

- Each market pig and sow excretes 30 lbs of plant available N

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- 525,240 Tons of plant available N (2006)
- ~640,537 Tons  $\text{NH}_3$
- If  $\text{NH}_3$  is worth \$900/ton = \$576,483,300

# Crop-Livestock Synergy

- 2006 Livestock in Iowa
  - 654,490 Tons plant available N
  - ~798,159 Tons  $\text{NH}_3$
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- If  $\text{NH}_3$  is worth \$900/ton = \$718,343,100



# Energy use by N fertilizer

- 1 ton  $\text{NH}_3$  requires 40,000  $\text{ft}^3$  natural gas

## Natural Gas

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- 1,029 BTU/ $\text{ft}^3$
- July 16, 2008 Chicago: \$11.24/million BTU

## For every pig we remove from IA

- Remove 30 lbs plant available N
- \$16.46, if  $\text{NH}_3$  costs \$900/ton
- Add 37 lbs  $\text{NH}_3$
- Add 740 ft<sup>3</sup> natural gas or 761,460 BTU
- \$8.56 in added natural gas use at today's prices
- A pig may be worth ~\$25 in nutrient cycling and energy use avoidance



# Will livestock be raised?

- Yes, especially where crop-livestock nutrient cycles recognized and supported

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- Human food system-Pig feeding synergy has vast potential
- Innovation and flexibility will be key
- Scale and product distribution may change



# Livestock feeding in 2033

- Shift away from grain fed ruminants?
- Decline in grain-fed pigs and poultry?
- Seems reasonable, unless we figure out how to change Laws of Thermodynamics