

Make Milk or Manure: Reducing Nitrogen Excretion With Carbohydrates

Mary Beth Hall

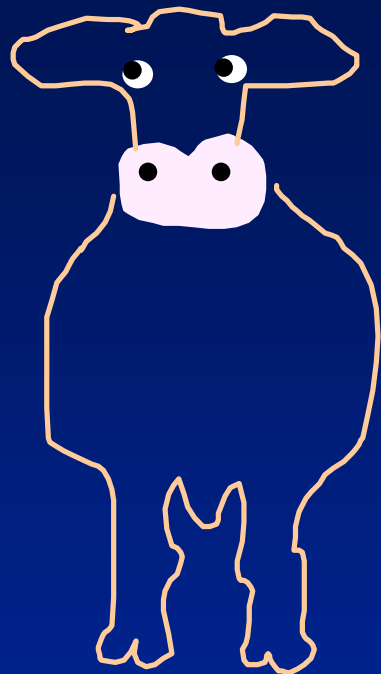
U. S. Dairy Forage Research Center

USDA – Agricultural Research Service

Madison, WI



Feed →



Feed

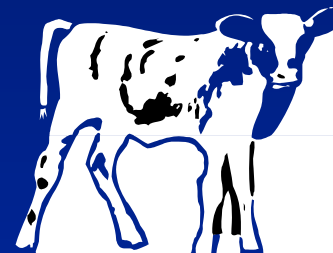
- Milk



- Growth/
Reserves



- Calf



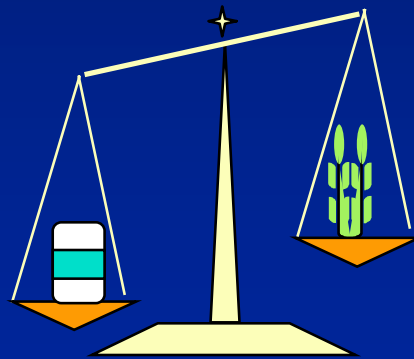
= Manure



If feed does not make milk,
it makes manure.



Our ration formulation efforts combined with management largely determine whether cows produce milk or manure.

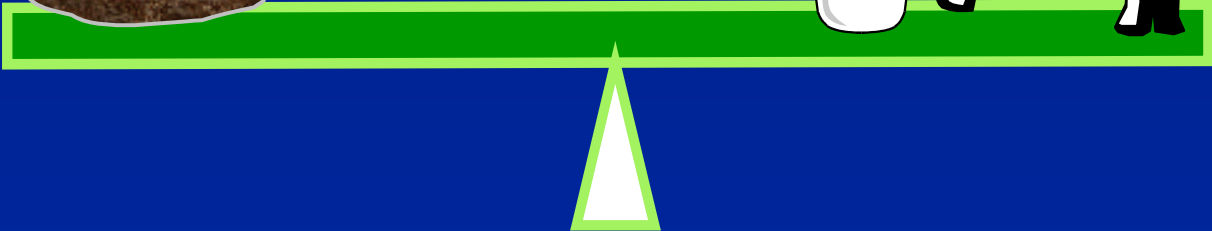


Feed efficiency proportion of waste

Manure



Salable
product



Feed Efficiency

★ The balance of protein and energy for cow and her microbes and protein digestibility are reflected in efficiency of protein or nitrogen use.

$$\text{Milk N (lb)} = (\text{Milk lb} \times \text{protein}\%) / \underline{6.38}$$

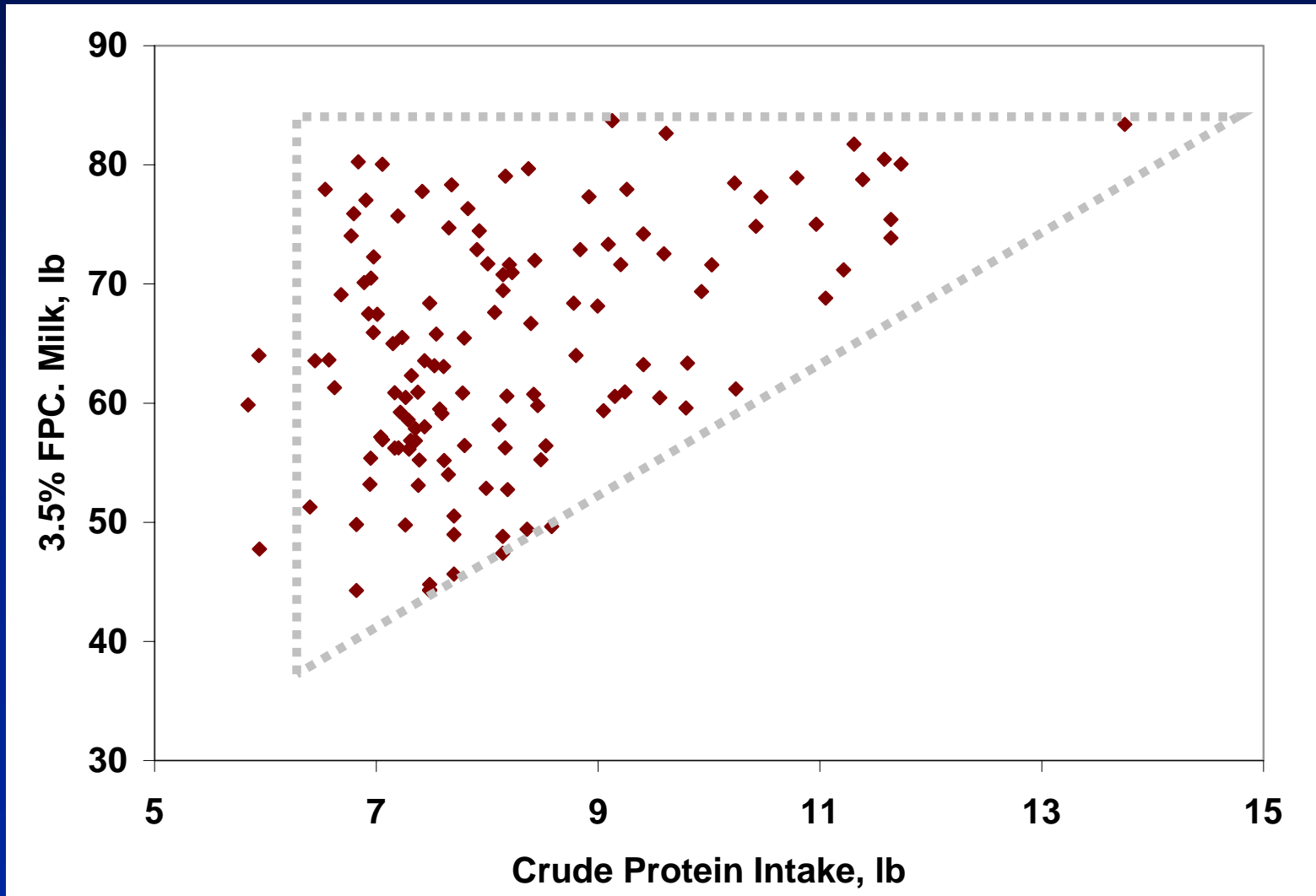
$$\text{Intake N (lb)} = (\text{Intake lb} \times \text{CP}\%) / \underline{6.25}$$

$$\text{Feed efficiency} = \text{Milk N} / \text{Feed intake N}$$

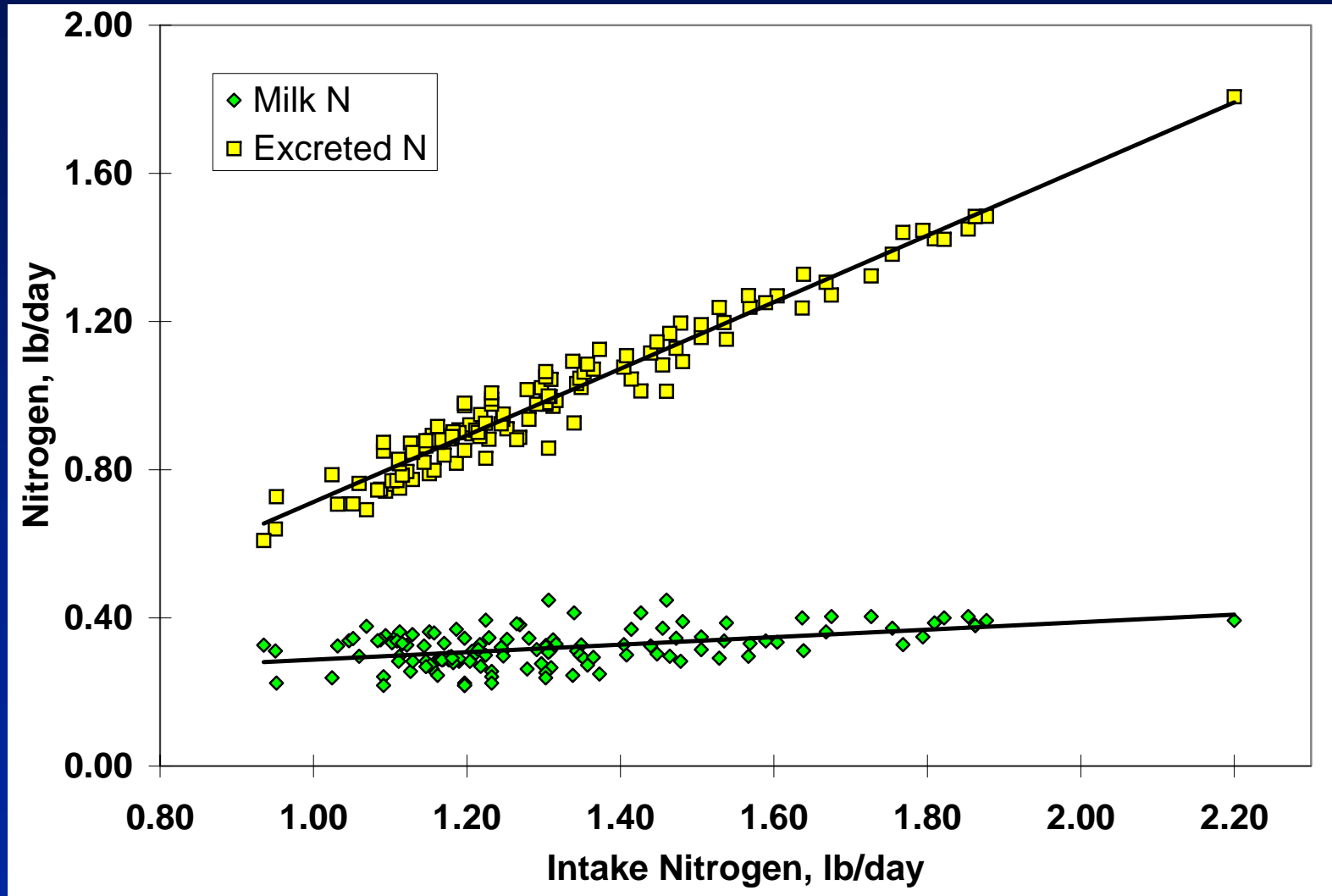
Normal = 0.2 to 0.3+, Problem = <0.2 (?)



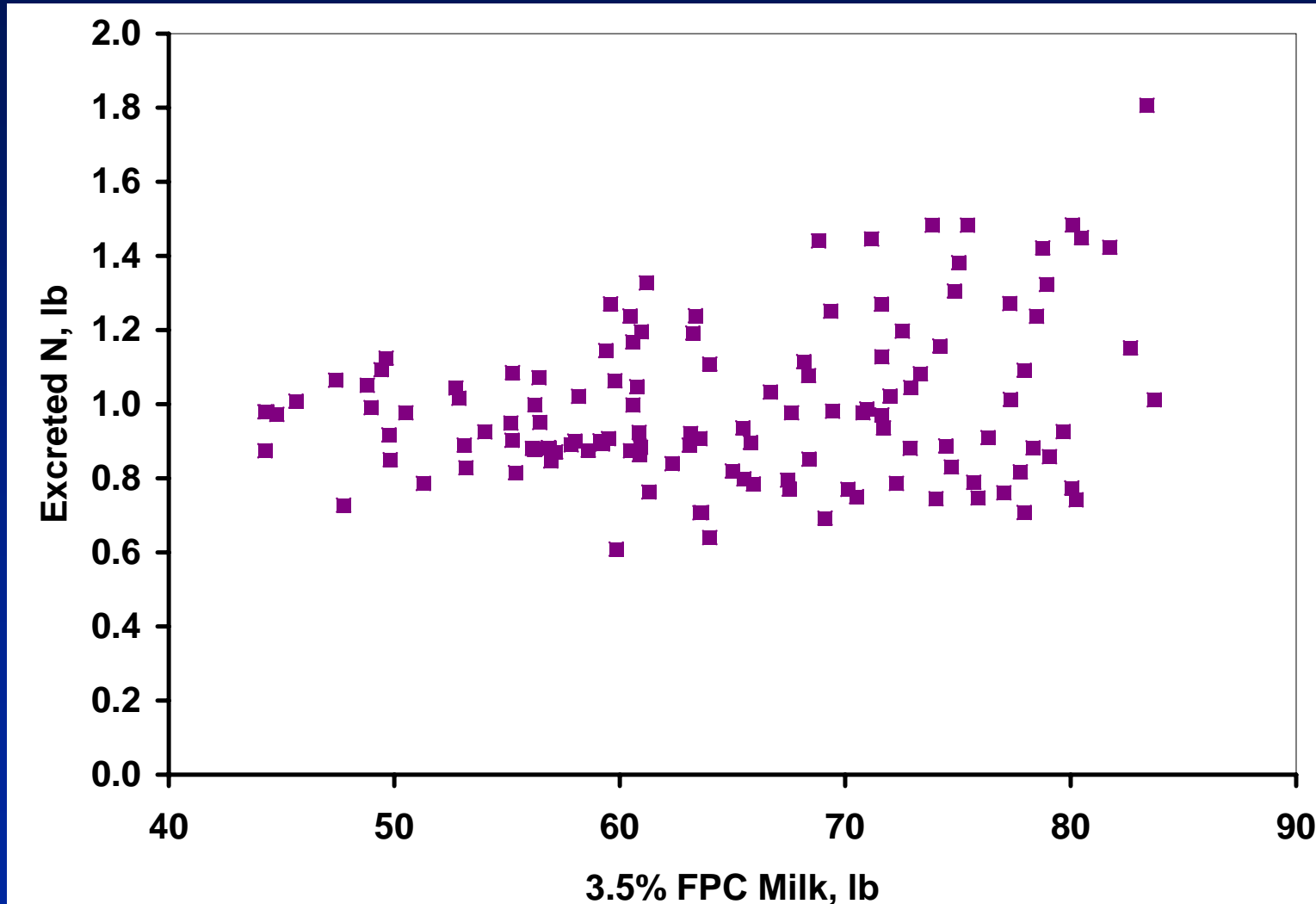
Milk Yield vs. CP Intake



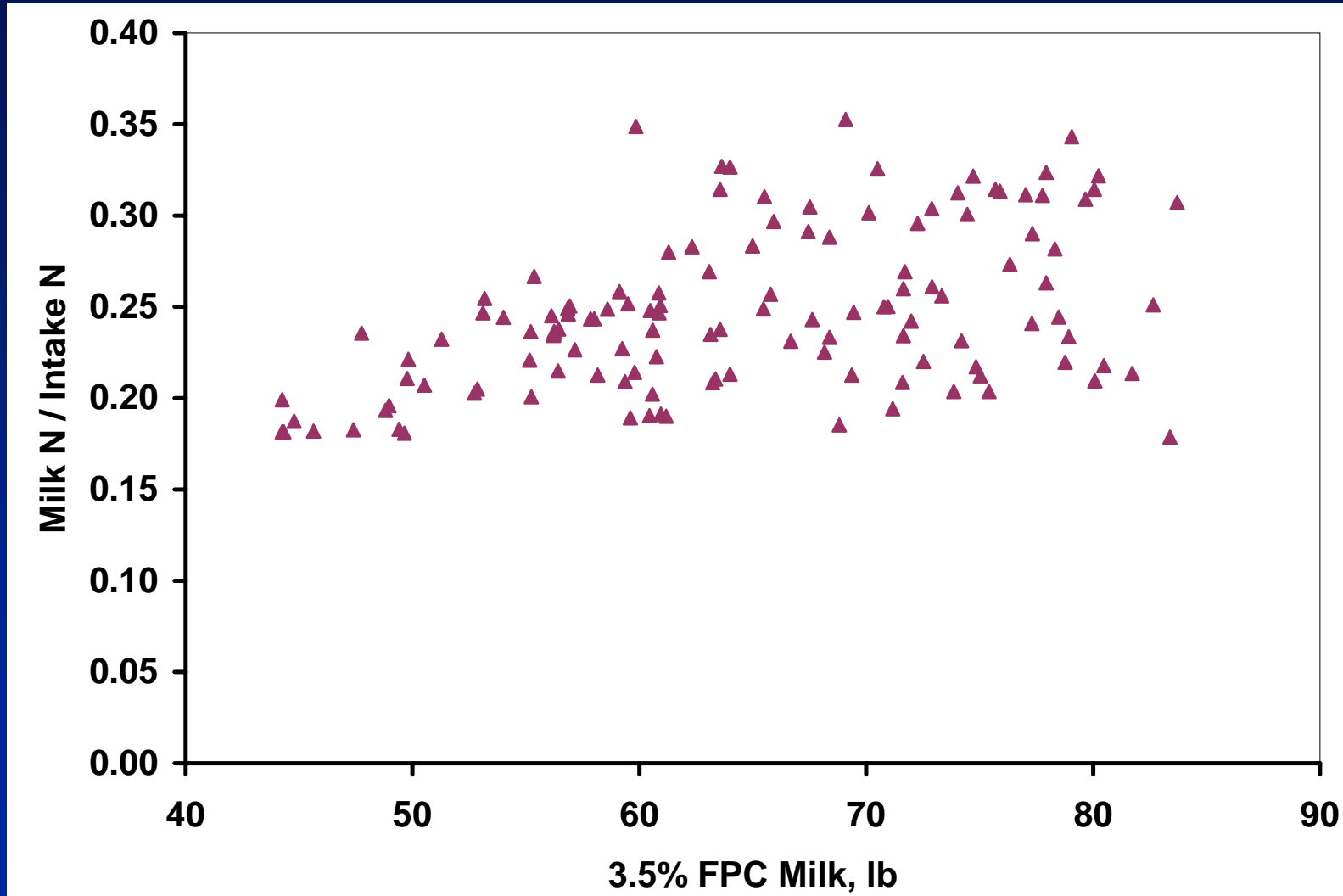
Nitrogen: Intake, Milk, & Excreted



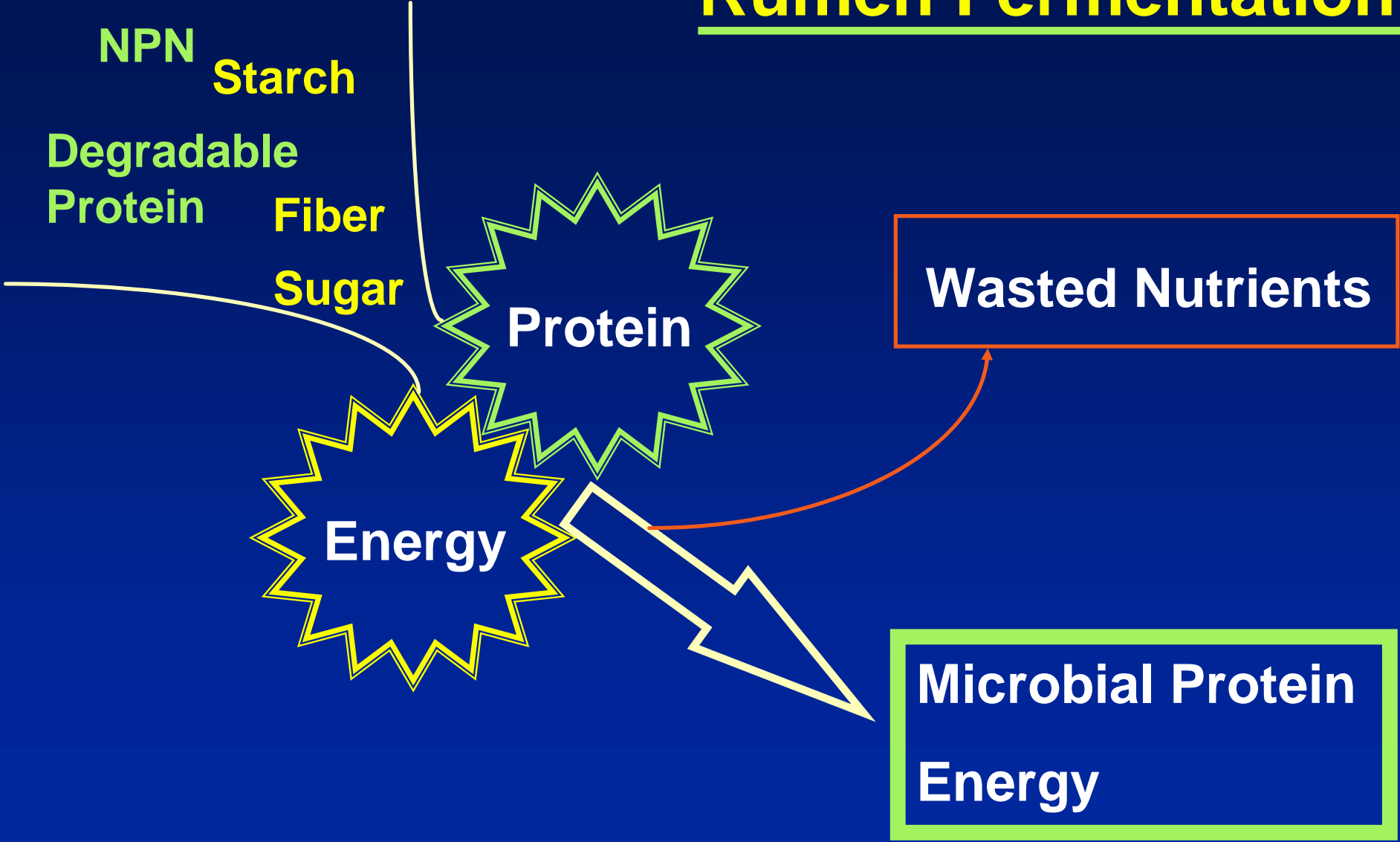
Excreted N vs. Milk Yield



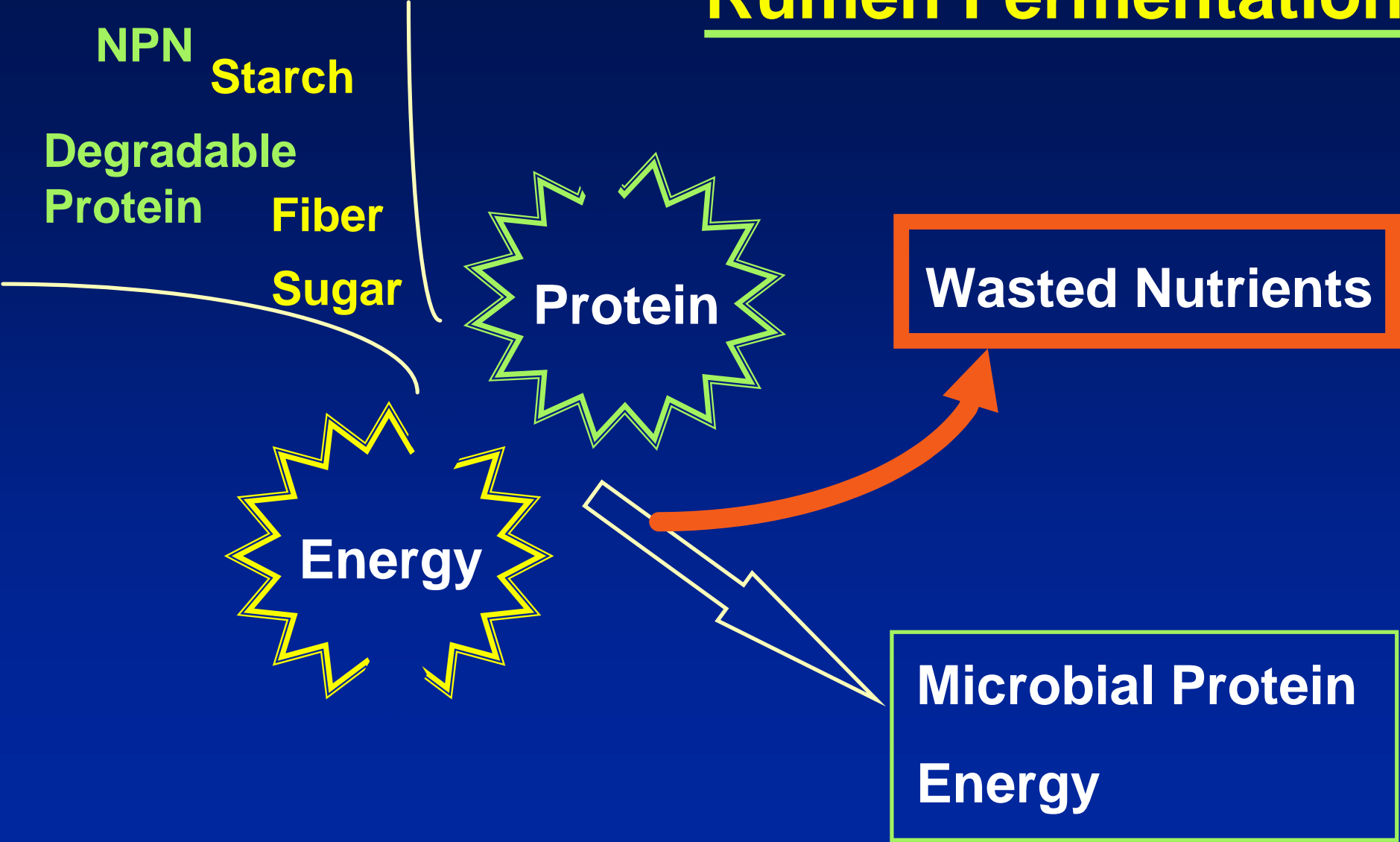
N Efficiency vs. Milk Yield



Rumen Fermentation



Rumen Fermentation



NPN

Starch

Degradable

Protein

Fiber

Sugar

Protein

Energy

Wasted Nutrients

Microbial Protein

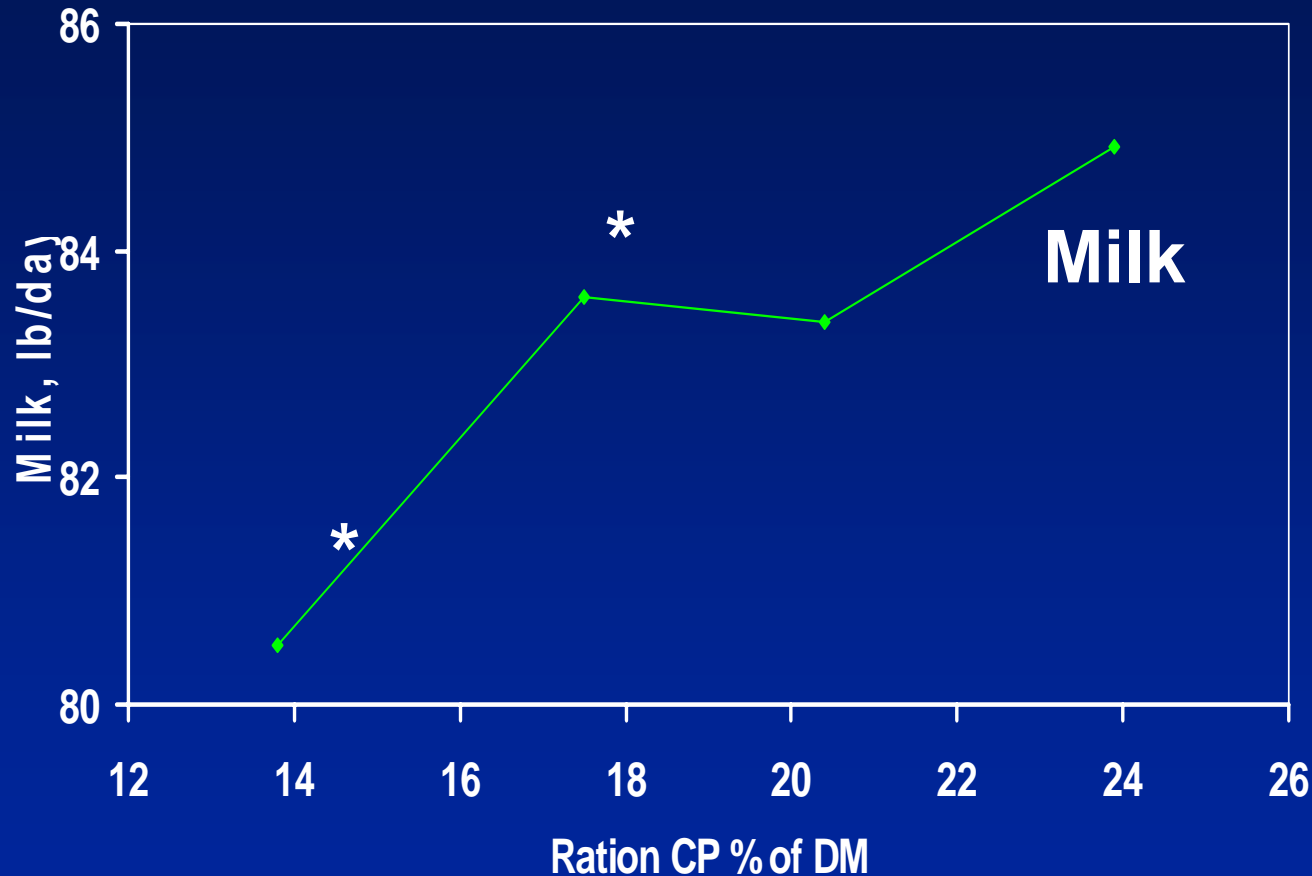
Energy



**What happens when we
don't feed enough
digestible carbohydrate?**



Cottonseed Meal vs Starchy Feeds

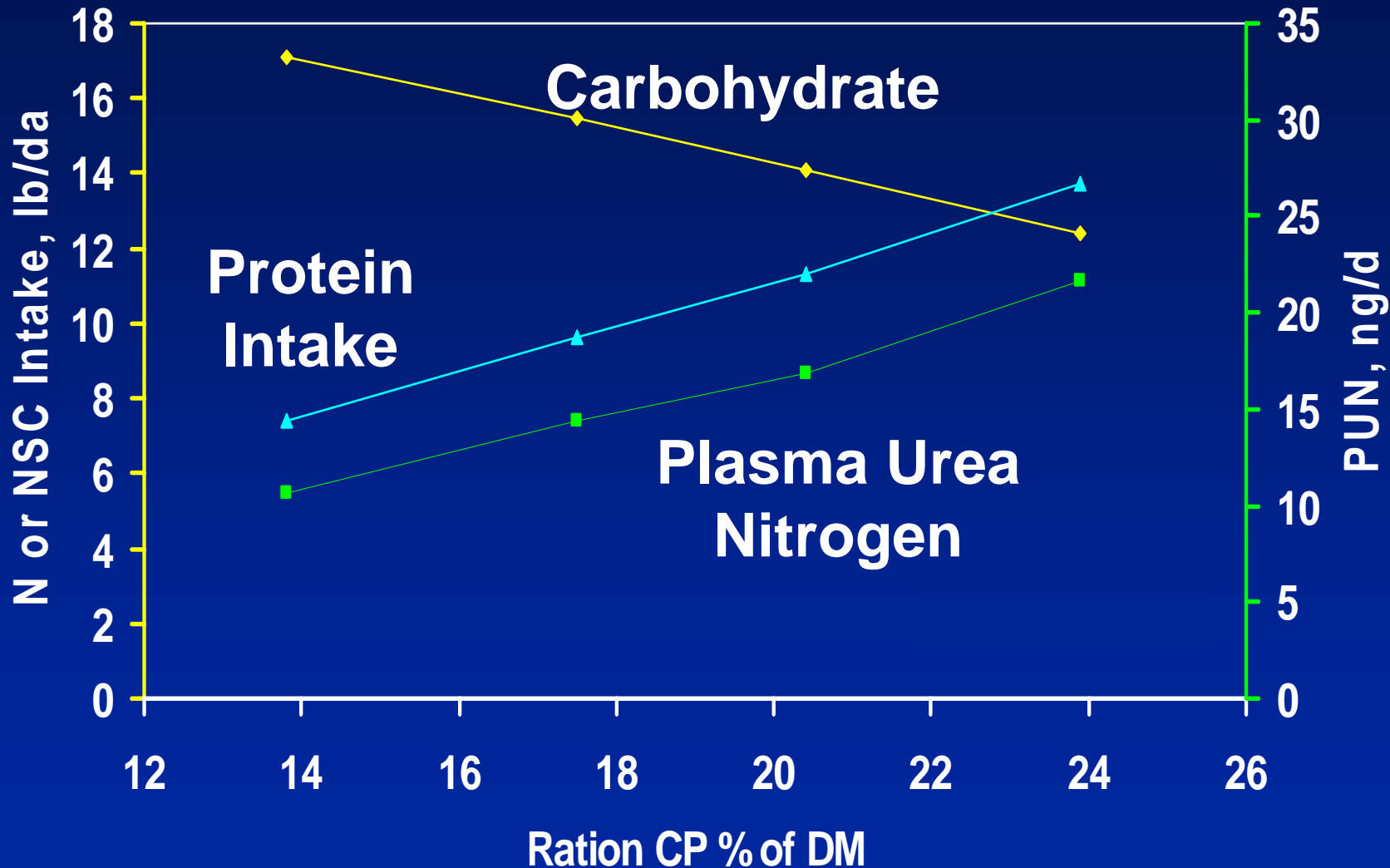


Milk Response to Additions of Cottonseed Meal Substituted for Maize and Barley

* Milk yields differ, $P < .01$

Grings et al., 1991

Cottonseed Meal vs Starchy Feeds



Grings et al., 1991

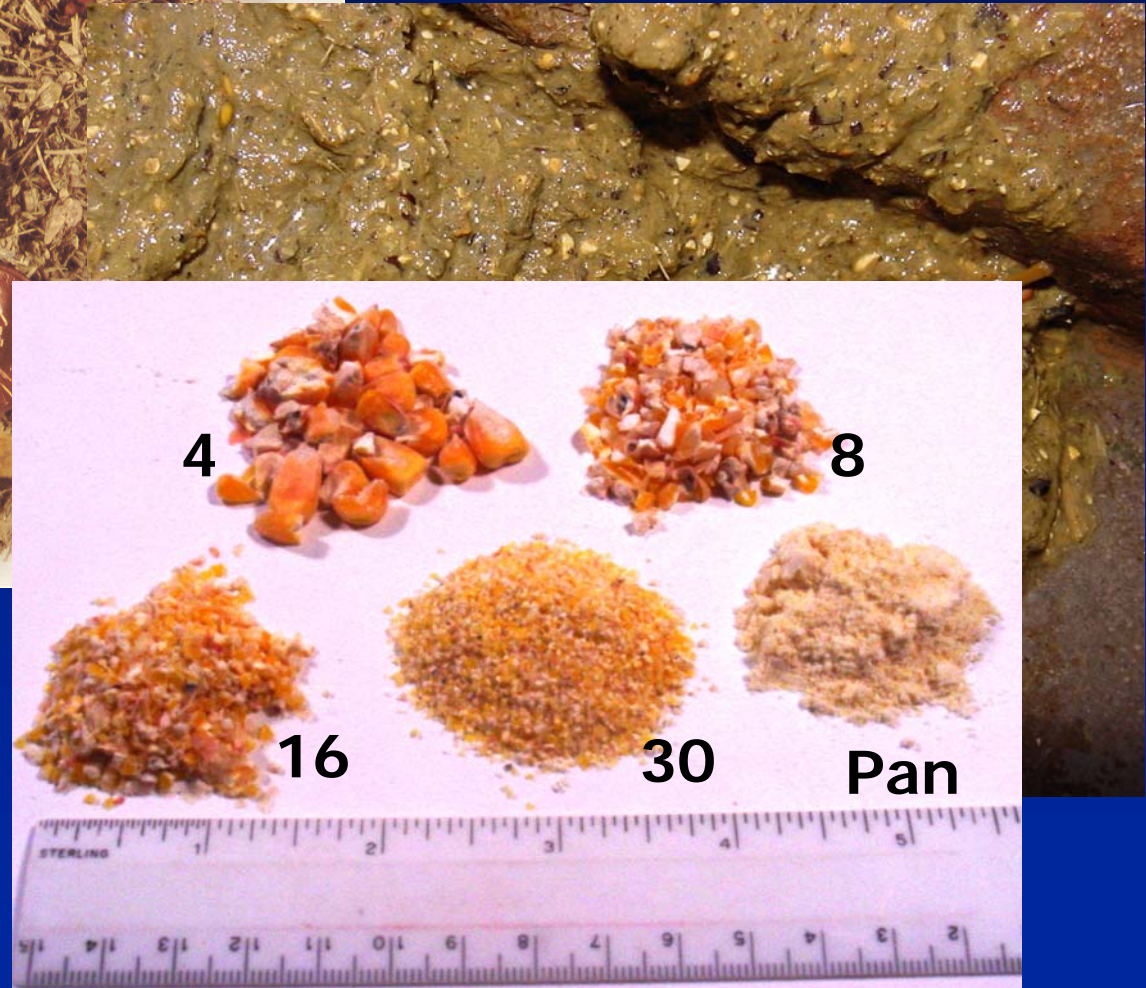
Eaten Does Not Mean Digested



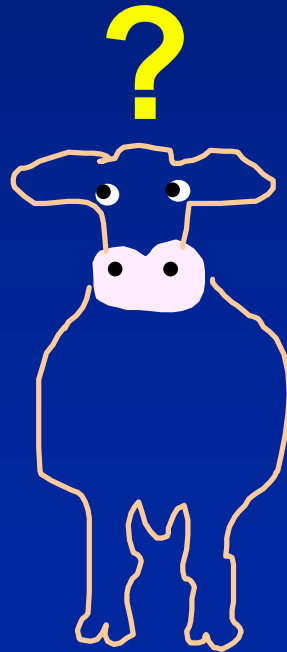
Coarse corn meal



Poorly chopped/processed corn silage



Effective Fiber

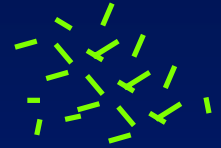


Total & Physically Effective Fiber

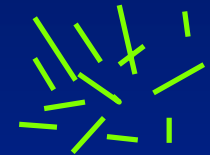
Total NDF: 28 - 35% of ration dry matter

Effective NDF

- enhances rumen function
 - increases rumination
- effective NDF is affected by particle size, digestibility, density, hydration,

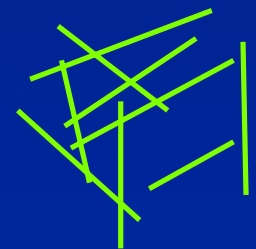


Fine



Medium

At least 40% of cows not eating, drinking, or sleeping are chewing their cud.

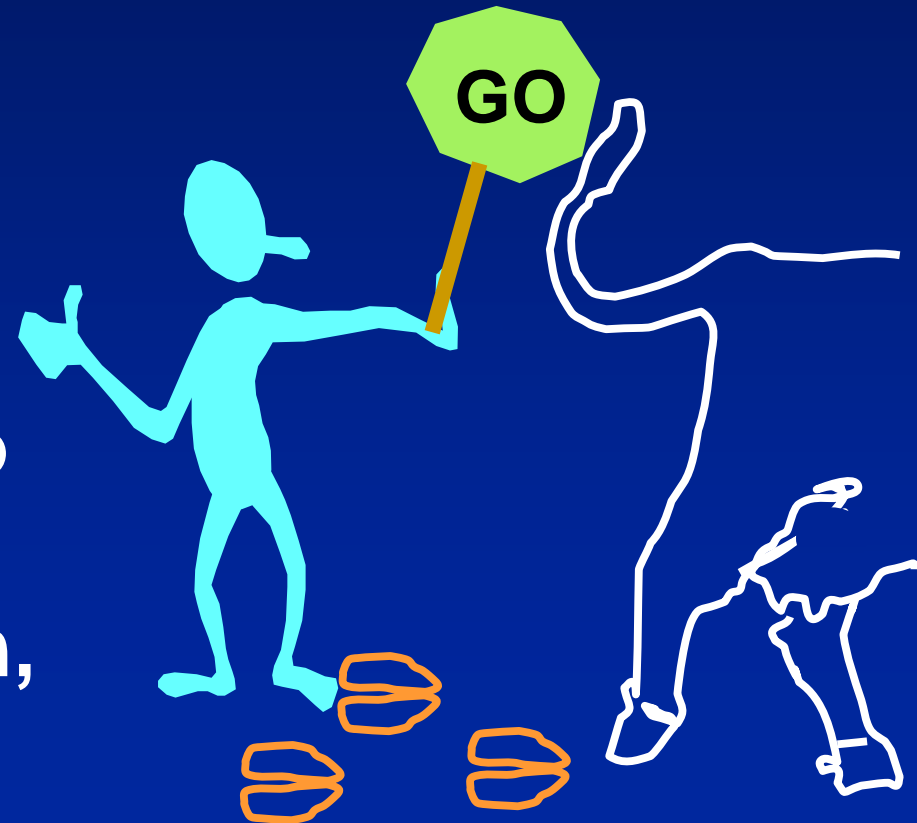


Coarse

Strike a Balance



- ✦ Don't overfeed protein
- ✦ Feed digestible protein
- ✦ Feed digestible carbohydrate
- ✦ Feed the right balance of carbohydrate* & fat so the cows have enough energy to use the protein, and stay healthy.





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Strike the Right Balance.



NFC	Forage	Starch	Effective Fiber
Feed Processing		Dig. Rate	Protein
Cow Comfort		Feeding Management	
Palatable	No Toxins	Well Preserved	