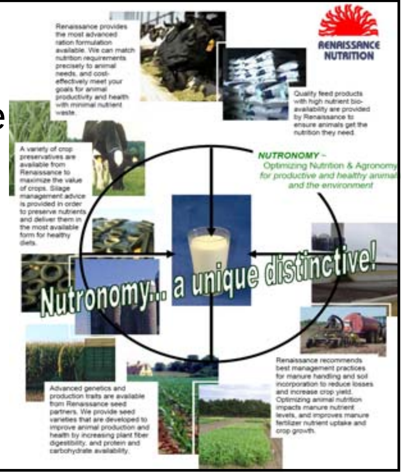
Dairy and the Environment

2007 Bucknell Conference

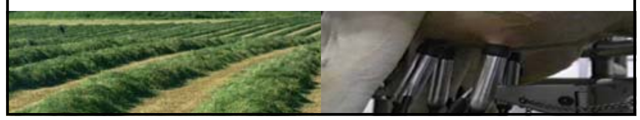
Dr. Tim Snyder

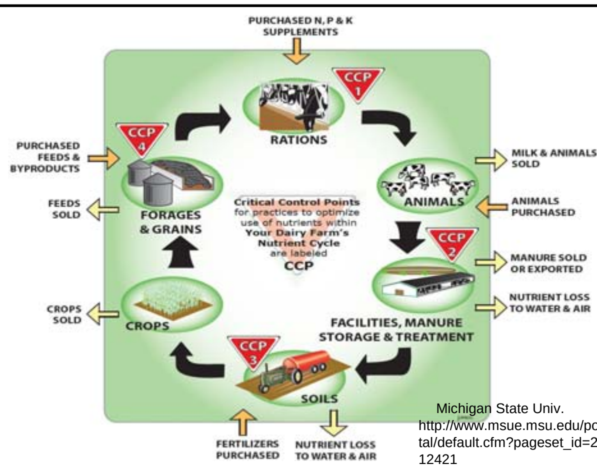
Renaissance Nutrition



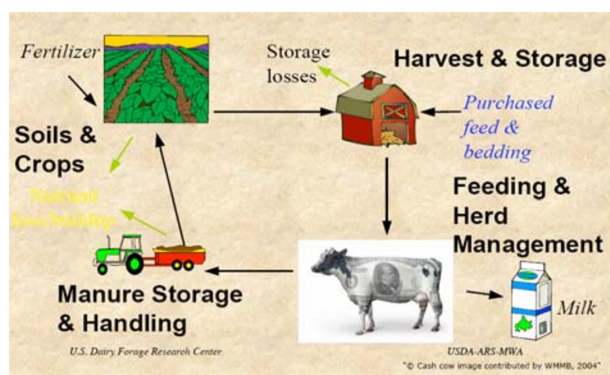
Nutronomy Goals

- Optimize DM Intake, milk yield & components
- Optimize forage intake, control costs
- Ensure adequate fiber mat & cow health
- Balance carbohydrate and protein fractions
- Optimize fermentation & rumen bug protein
- Increase feed efficiency & minimize environmental loss and waste





Michigan State Univ.
http://www.msue.msu.edu/portal/default.cfm?pageset_id=212421



Hatfield ADSA 2006

2001 NRC ***Ch. 12*** Dairy Nutrition & the Environment

National Livestock and Poultry Environmental Learning Center

Connecting Experts With Those Assisting Producers

Home | About the Center | Project Team | Subscribe to Newsletter

What's New? | Webcast Series | Newsletter

LPELC Topics
- Alternative Technology
- Nutrients
- Pathogens

National Resources
- Education
- Regulatory/Policy
- Research
- Technical Assistance
- Financial Assistance
- CSREES Water Quality

Continuing Education Units

Webcast Series
- Upcoming Webcasts
- How Do I Participate?
- Archived Webcasts
- Troubleshooting

Newsletter
- Current Issue
- Past Issues

What's New?

May Webcast Archived-Thank you to everyone who joined us for the "Value of Manure in Land Application Systems" webcast held on May 18, 2007. More... The recorded presentation, given by Dr. John Lory and Dr. Ray Massey of the University of Missouri is available at our webcast archive. Download Power Point presentations Lory | Massey (May 21)

May Newsletter Available-Stories include: June Webcast is Value Added Processing of Manure; Webcast Planning Underway; Alternative Technologies Web Resources Available; FPPC Program Offers Cost Share for Innovative Manure Technologies; Iowa State to Host Conference on Anaerobic Treatment of Ag Waste. (May 4) View Newsletter | Subscribe to Newsletter

Webcast Archive Available -Thank you to everyone who joined us for the April webcast seminar, "Lessons Learned from the North Carolina Experience with the Smithfield Agreement." More... The archived presentation is available for on-demand viewing at our archive site. Download the Power Point presentations for the speaker. Williams (April 23)

Alternative Technologies Resources Now Available. The LPE Learning Center "Alternative Technologies for Manure Management" team has compiled a set of resources for those interested in learning more about this topic. The team will continue to make additions to the website over the next several months. Go to the alternative technologies site (April 20)

Webcast Series

LPE Learning Center Webcasts are held on the third Friday of each month at 2:30 pm (eastern), 1:30 pm (central), 12:30 pm (mountain) and 11:30 am (pacific). Real Player is needed to view LPELC webcasts.
How do I participate? | Schedule Through November, 2007

Upcoming Webcasts

"Value Added Processing of Manure" June 15, 2007, 2:30 pm (eastern). Speakers are Reg Clause of Iowa State University, Dr. Doug Parker and Dr. Erik Lichtenberg of the University of Maryland. More...

Archived webcasts are available for on-demand viewing. The archive also includes links to additional reading on that topic, information on receiving continuing education units, and may also include Power Point slides, Q&A summary, and links to specific segments of a webcast. More...

Subscribe now...Join 900 subscribers and receive our free monthly newsletter, information about the webcast series and other LPELC resources. Subscribe...

Newsletter

Current Newsletter....Contains information on the webcast series, upcoming additions to the website, national resources available to those who advise livestock and poultry producers and current happenings in the word of livestock and poultry manure management. View newsletter...

http://lpe.unl.edu/index.html

Dairy and the Environment Articles

2007 Dairy publications

- **Hoards Dairyman** March 10 ***Hoards has heard… WI farms***
- **Hoards Dairyman** March 10 ***Hoards has heard…IN farms***
- **Progressive Dairyman** March 10 ***Unlocking manure's full potential***
- **Progressive Dairyman** March 10 ***Settling issues with sand-laden manure***
- **Feedstuffs** March 12 ***Manure production efficiency improves***
- **Farmshine** March 9 ***Nutrient management and nutrition linked***
- **Farmshine** March 9 ***Benefits cited for turning wastes to fuel***
- **Farmshine** March 9 ***Revised nutrient management regs in effect***
- **Farmshine** March 9 ***Precision feeding does a whole world of good.***
- **Country Folks** March 19 ***Nitrogen management on Dairy Farms***

Hoards Dairyman, May 25

Measuring Dairy's Impact on Air Pollution
Squeezing the value from your dairy manure
The basics on using manure solids as bedding
Sand-manure separation… What options do we have?
So, when is a good time to spread manure

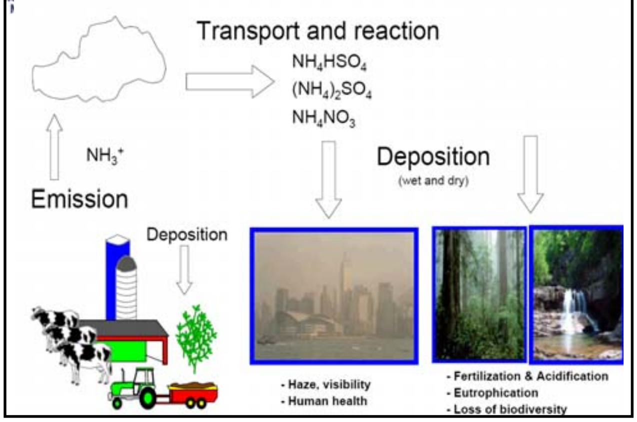
Measuring Dairy's Impact on Air Pollution

Hoards Dairyman, May 25, 2007

- CA regulatory decisions were based on 1938 research of an elephant, a horse, 12 cows, some goats and sheep
- National Air Emission Monitoring Study
  CA, TX, WA, NY, IN, WI dairies selected
- Ammonia, sulfur dioxide, nitrous oxide, carbon dioxide, VOC's and particulate matter will be measured at key locations on each farm over 2 years. EPA charts developed to determine if producers will need Clean Air Act permits
- NMPF 3 year project with UNH, UC-D, USDA to develop computer simulations of air emissions from feed, animals, housing, storage, land application to allow farmers to input info, predict emissions and give suggestions to lower them
- EPA and states want to lower dairy emissions where air quality standards are not met; all dairies in the area affected

Ammonia cycle

Powell ADSA 2006



My Big Five Feeding Challenges

Mike Hutjens Hoards May 25, 2007

- #1 Feed Management, Sorting, Inventory control
- **#2 Nitrogen and Phosphorus Excretion**
- MUN could become a benchmark to determine environmental risk…
- WI workers indicates CP below 16.5% support high milk production based on amino acid models
- Additional research may lower P below .38% of DM
- Corn distillers feeding may increase N and P fed
- Nitrogen Efficiency could become a benchmark for evaluating feeding Programs

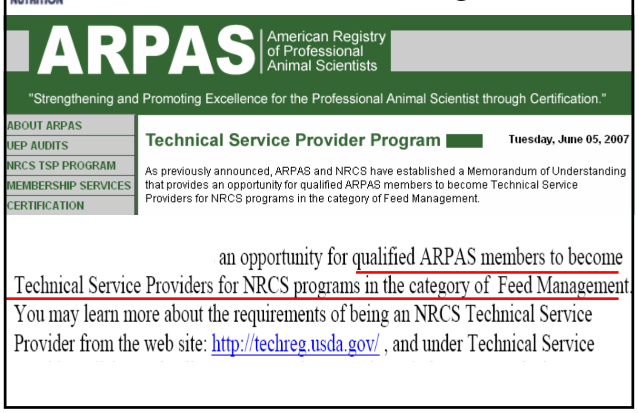
Dairy and the Environment at Nutrition Conferences

- Daily Manure Nutrient Flow from a Lactating Cow Facility, M. Hollmann et. al. **2007 Tri-State Nutrition Conference**

4 State Nutrition Conference - June 2007

- Practically Dropping Protein of Diets to Reduce Nitrogen Excretion - D. Byers
- What is the National feed management project all about? - Joe Harrison
- Feed management workshop for professionals desiring to take the ARPAS Feed Management Certification, -Harrison and Shaver
- PSU Dairy Nutrition Workshop will have a similar session

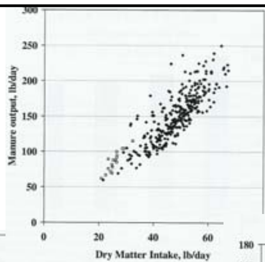
NRCS NMP - Feed Mgt section

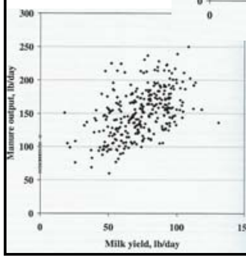


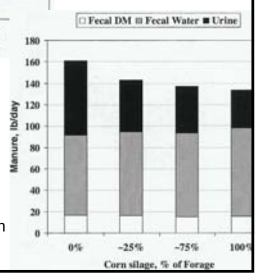
Factors affecting Manure on Dairy Farms

Weiss et al, 2007 Tri-State Nutrition Conference

- 15 experiments, 337 observations, 67 lactating diets cow
- Lactating cows avg 100# feces + 50# urine = 150# manure
- 100 # milk/cow manure output ranged from 125 to 250 #
- Manure output, #/d = (3.1x DMI, #/d) -1.8, i.e. about 3 : 1
- Dry cows produced 86 # manure (maintenance output!)
- 50 # milk/cow = 2.6 lb manure/ # milk ; 100 # milk/cow = 1.8 # manure / # milk; i.e. high milk dilutes maintenance !
- Manure output increases at an increasing rate as DMI increases; lower digestibility at higher passage rates
- Cows fed all haycrop silage produced twice as much urine as all corn silage fed cows; K substantially increases urine







Weiss et al 2007
Tri-State Nutrition
Conference

Jim Linn, 2006 Cornell Nutrition Conference

- Good FE is not only of economic importance, but also is a monitor of nutrient management on farms. As FE increases, more nutrients are directed into milk production with less manure and nutrients excreted.
- As indicated by the NRC (2001), dietary protein utilization improves when the essential amino acid profile absorbed more closely meets the animal's essential amino acids requirement.
- Feeding diets that meet amino acid requirements of dairy cattle should reduce wastage of dietary protein, increase efficiency of protein utilization for milk synthesis, and allow for decreased CP levels in diets.

VA "Dairy and the Environment" projects

- VA Precision Phosphorus Feeding Incentive Program
- Fall 2005 through 2009 183 VA dairies;
  $12/cow <105% NRC P;
  $6/cow <115%NRC P;
  only 25% met $ reward so far;
  NRCS and VA Dept of Conservation funded
- Free forage, TMR testing, consultation services

Stallings et al MANC 2007

MD "Dairy and the Environment" Projects

- Title: A program to improve dairy herd nutrition using milk urea nitrogen
- July 1 2005 to June 30, 2008 NRCS funded $150 per farm for MUN < 11; $100 for MUN <12
- Title: Enhancing Nutrient Efficiencies on Dairy Farms in the Monacacy Watershed MD and PA pilot in 2007 National Fish and Wildlife funded Nutritionists certified to work with NRCS and U MD; $750 for Nutritional consultant; up to $4500 per farm

Stallings et al MANC 2007

PA "Dairy and the environment" projects

- Title: Precision Dairy Feeding to Reduce Nutrient Pollution in PA Waters and the Chesapeake Bay
- July 2005 through June 2008; NRCS funded
- 60 farms, 12 precision feeding workshops; Profitability Assessment Dairy Tool
- Forage, TMR, fecal, urine, MUN testing

Stallings et al MANC 2007

MEASURING AND IMPROVING FEED EFFICIENCY IN LACTATING DAIRY CATTLE

Intern Project 2007

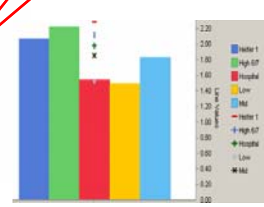
FEED EFFICIENCY DETERMINATOR FED™ BY ZINPRO

Feed Efficiency

Group ID:	Farm A
% BST Usage:	0
Avg DIM:	210
Avg SCC:	240
Avg MUN:	0
Comments:	
Calculated DMI, lb/d:	53.15
ECM, lb/d:	75.00
Cost for growth, 1st calf heifers, ECM, lb/d:	-0.71
Cost for heat stress, ECM, lb/d:	0.00
Cost for cold temperature stress, ECM, lb/d:	0.00
Cost for excess walking, ECM, lb/d:	-0.26
Cost of maintenance, ECM, lb/d:	0.00
Lactation stage/parity adjustment, ECM, lb/d:	-0.87
lb milk protein produced/lb CP consumed:	0.26
Observed feed conversion, ECM/DMI:	1.41
Adjusted feed conversion, ECM/DMI:	1.43
$ milk revenue generated per$ feed cost (adj.):	$2.59
$ milk revenue generated per$ feed cost (obs.):	$2.55
Income over feed cost per cow (adjusted):	$6.15
Income over feed cost per cow (observed):	$6.00
Herd Results:	
Observed herd feed conversion, ECM/DMI:	1.41
Adjusted herd feed conversion, ECM/DMI:	1.43
$ milk revenue generated per$ feed cost (adj.):	$2.59
$ milk revenue generated per$ feed cost (obs.):	$2.55
Income over feed cost per cow (adjusted):	$6.15
Income over feed cost per cow (observed):	$6.00

N Efficiency .26

Feed Efficiency 1.41



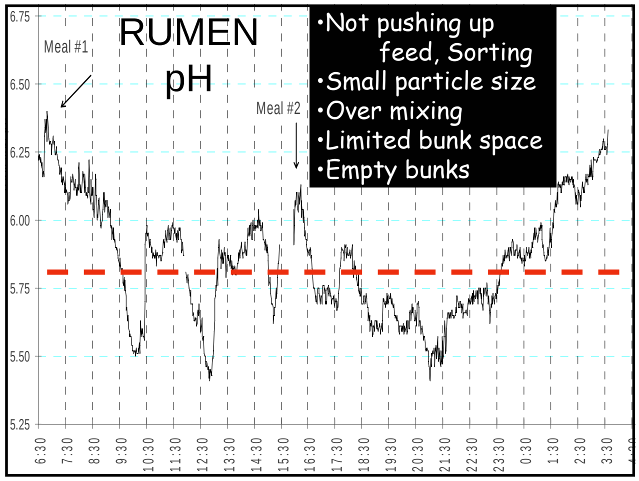
How Can We Alter Feed Efficiency Nutritionally?

1. High quality forages
2. High digestibility feeds
3. Selection of CHO and N sources

4. The key is to balance rumen fermentation to optimize nutrient use and microbial protein synthesis

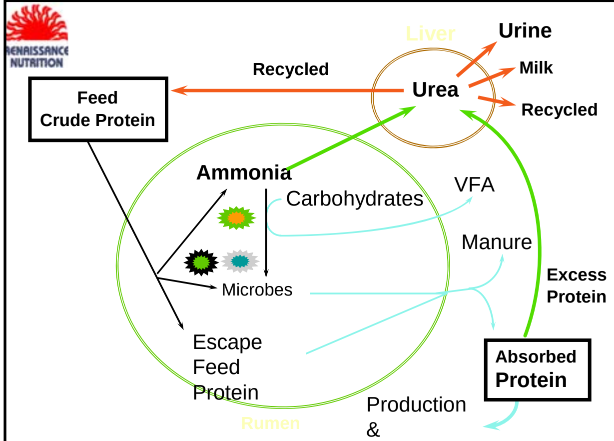
Ration Digestibility & Feed Eff.

- "Forage quality is the single most important factor that affects ration digestibility"
- "Balanced rations that are higher in forage and lower in starch generally result in a healthier rumen environment and less acidosis potential"
- "An unhealthy or acidic rumen environment results in poor digestion and feed efficiency"

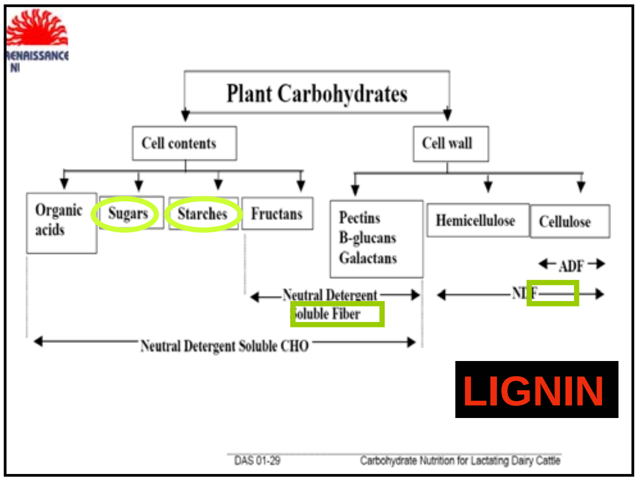


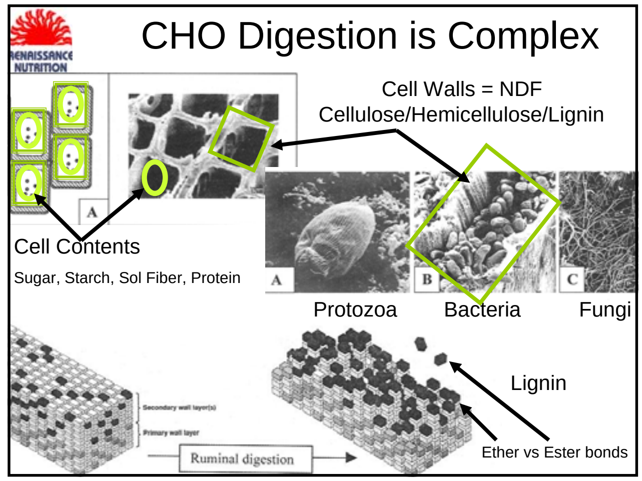
PSU Rumen Video

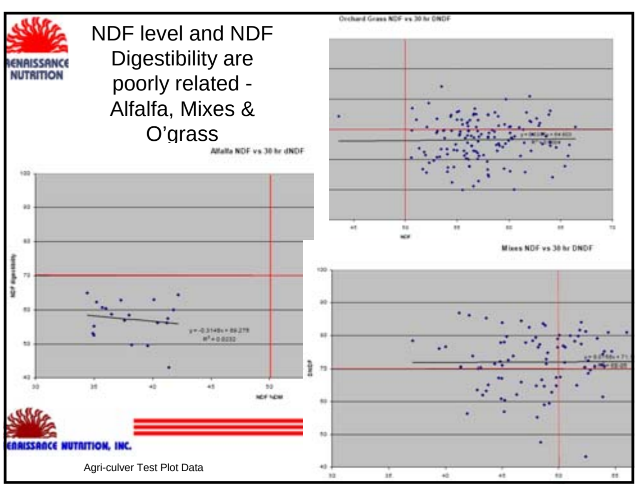
- **Rumen motion**
- **Rumen mat "float"**
- **Healthy rumen papillae**
- **Absorbing nutrients**
- **Fiber and grain in balance**

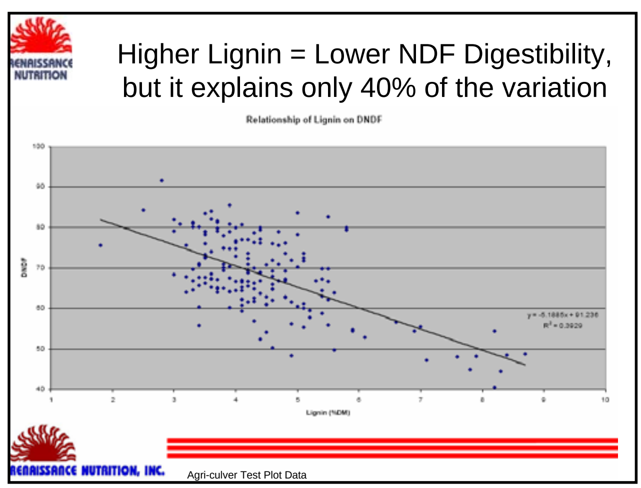


Dr. M. B. Hall - Univ. of Florida

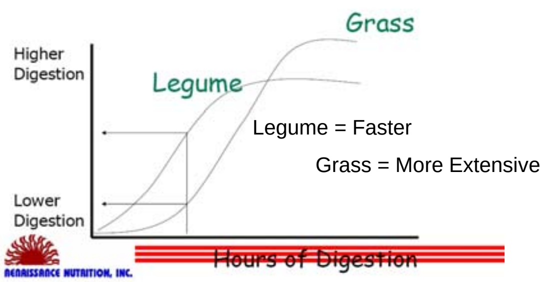

Plant Carbohydrates
Cell contents
Cell wall
Organic acids
Sugars
Starches
Fructans
Pectins
B-glucans
Galactans
Hemicellulose
Cellulose
ADF
Neutral Detergent
Soluble Fiber
NDF
Neutral Detergent Soluble CHO
LIGNIN
DAS 01-29
Carbohydrate Nutrition for Lactating Dairy Cattle


CHO Digestion is Complex
Cell Walls = NDF
Cellulose/Hemicellulose/Lignin
Cell Contents
Sugar, Starch, Sol Fiber, Protein
Protozoa
Bacteria
Fungi
Lignin
Secondary wall layer(s)
Primary wall layer
Ruminal digestion
Ether vs Ester bonds


NDF level and NDF Digestibility are poorly related - Alfalfa, Mixes & O'grass
Orchard Grass NDF vs 30 hr DNDF
Alfalfa NDF vs 30 hr dNDF
Mixes NDF vs 30 hr DNDF
RENAISSANCE NUTRITION, INC.
Agri-culver Test Plot Data

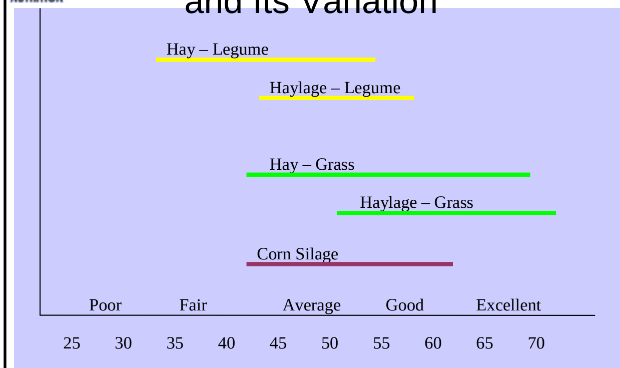

Higher Lignin = Lower NDF Digestibility, but it explains only 40% of the variation
Relationship of Lignin on DNDF
DNDF
Lignin (%DM)
RENAISSANCE NUTRITION, INC.
Agri-culver Test Plot Data

Rate vs. Extent of Digestion



More research ongoing with annual grasses, BMR SS

Forage NDF Digestibility and Its Variation



30-hr NDFD, % of NDF

Source: Dairy One Forage Lab (2000 – 2005)

RFQ vs RFV

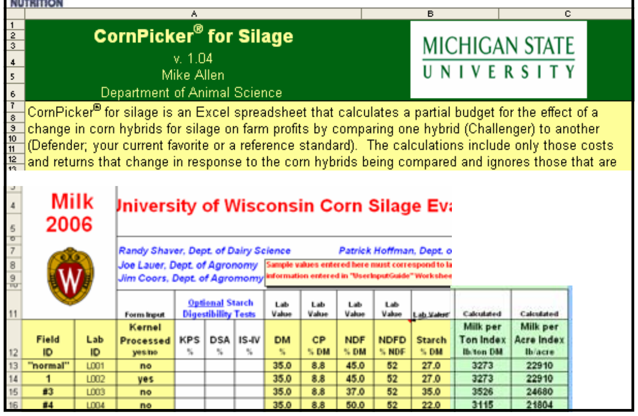
- Relative forage Quality vs Relative feed Value
- Digestibility estimate included in RFQ
- More correctly credits value of grasses

NDF Digestibility

- 1% increase in NDFD
  = 0.44 # more DMI
  = 0.55 # more 4%FCM
  » Oba and Allen 1999

- WA Cows > 92 # milk
  + 1 % more digestibility = 1.41 # Milk Production
- NE Research
  < 55 # - little response
  55-70# + 3 to 8# milk
  >75 # + 8 to 20# milk
- Feed higher NDFD forage to Hi producers, fresh and close up cows

Variety Selection



CornPicker® for Silage
v. 1.04
Mike Allen
Department of Animal Science
MICHIGAN STATE UNIVERSITY

CornPicker® for silage is an Excel spreadsheet that calculates a partial budget for the effect of a change in corn hybrids for silage on farm profits by comparing one hybrid (Challenger) to another (Defender; your current favorite or a reference standard). The calculations include only those costs and returns that change in response to the corn hybrids being compared and ignores those that are

Milk 2006

Jniversity of Wisconsin Corn Silage Eva

Randy Shaver, Dept. of Dairy Science
Patrick Hoffman, Dept. o
Joe Lauer, Dept. of Agronomy
Jim Coors, Dept. of Agronomy

Sample values entered here must correspond to la
information entered in "UserInputGuide" Workshee

		Form Input	Optional Starch Digestibility Tests			Lab Value	Lab Value	Lab Value	Lab Value	Lab Value*	Calculated	Calculated
Field ID	Lab ID	Kernel Processed yes/no	KPS %	DSA %	IS-IV %	DM %	CP % DM	NDF % DM	NDFD % NDF	Starch % DM	Milk per Ton Index lb/ton DM	Milk per Acre Index lb/acre
"normal"	L001	no				35.0	8.8	45.0	52	27.0	3273	22910
1	L002	yes				35.0	8.8	45.0	52	27.0	3273	22910
#3	L003	no				35.0	8.8	37.0	52	35.0	3526	24680
#4	L004	no				35.0	8.8	50.0	52	22.0	3115	21804

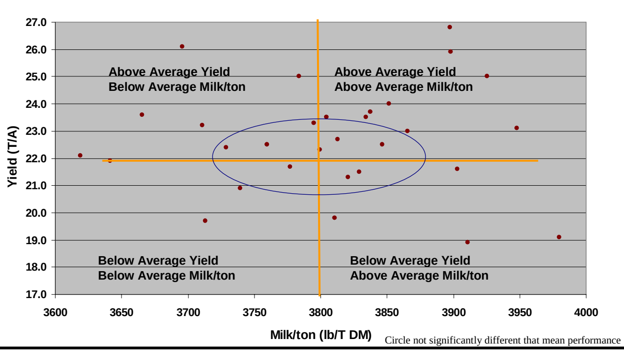
CS Milk/Ton PSU/PDMP

Example Selection Report
Average Across 3 Locations, 111 - 115 Day Hybrids 2005 PSU/PDMP

Milk/Ton lbs/ton Rank (value)	Statistical Relevancy	NDFD30 % Rank (value)	Yield tons/acre Rank (value)
1 (3765)		22 (48)	7 (21.8)
2 (3760)		26 (47.6)	22 (20.2)
3 (3757)		10 (48.7)	5 (21.9)
4 (3719)	Garst	7 (49.1)	27 (19.6)
5 (3715)		11 (48.7)	6 (21.8)
6 (3689)		3 (49.6)	28 (19.4)
7 (3669)		42 (46)	4 (22)
8 (3664)		37 (46.5)	11 (21.5)
9 (3664)	Mycogen	24 (47.7)	12 (21.5)
10 (3662)		29 (47.4)	38 (18.7)

Yield vs. Quality: Mid Maturity

Hybrids vary in yield and milk/ton potential!



Circle not significantly different that mean performance

PDMP/PSU 2005 Corn Silage trials

111-115 RM 3 location average

Highest NDFD30 %: Mycogen 7512

- Highest NDFD30 #/acre: Mycogen T25694
- Highest yield/acre: Mycogen T25694
- Top 10 Milk/Acre: Mycogen 2T780 (starch); Mycogen T25694 (NDFD30)

World Forage Super Bowl 2006

- *Grand Champion Corn Silage (BMR)*
- Mycogen F2F797 - Pine Tree Dairy
- Milk/Ton 4219

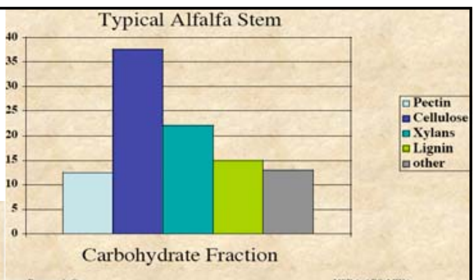
- *Grand Champion (Non-BMR) Corn Silage*
- Mycogen TMF 2N422 - Autumn Vista Dairy
- Milk/Ton 4184
- 8 of top 10 Non-BMR winners were Mycogen

World Forage Super Bowl 2006

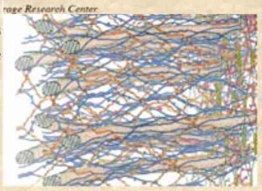
- *Grand Champion Dairy Hay*
- Mycogen 4A421 - Mike Beun
- RFQ 314
- Milk/Ton 3790

- *Grand Champion First Time Entrant Hay*
- Garst 630 - Hard Rock Farms
- RFQ 316
- Milk/Ton 3692

Cell Wall Model



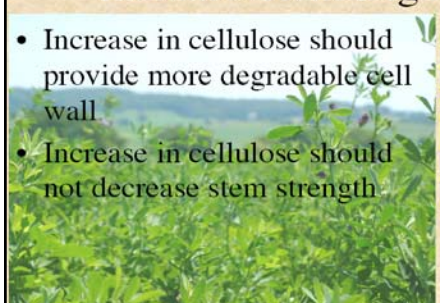
- Complex matrix of polysaccharides
- Cellulose synthase genes have been identified



Hatfield ADSA 2006

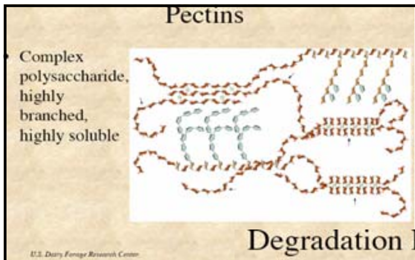
Increased Cellulose Increase Stem Digestion

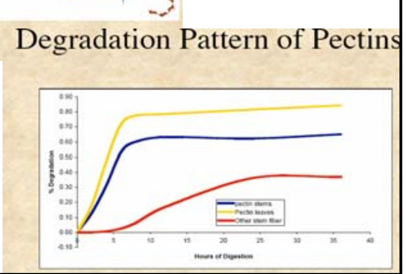
- Increase in cellulose should provide more degradable cell wall
- Increase in cellulose should not decrease stem strength



U.S. Dairy Forage Research Center *USDA-ARS-MWA*

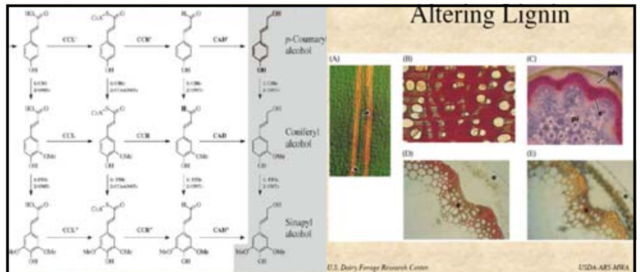
Hatfield ADSA 2006

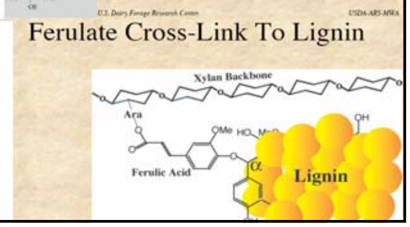




Research into increasing pectin levels

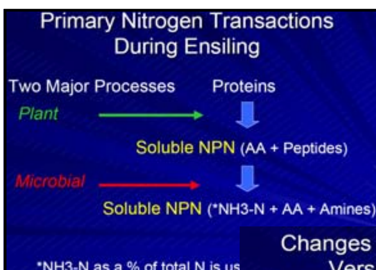
Hatfield ADSA 2006





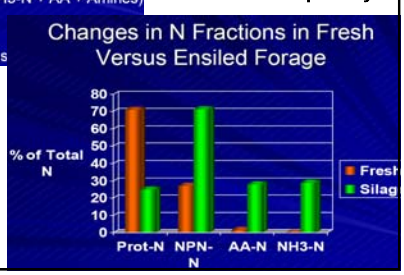
Research into Changing Lignin formation and linkages to other fiber components

Hatfield ADSA 2006

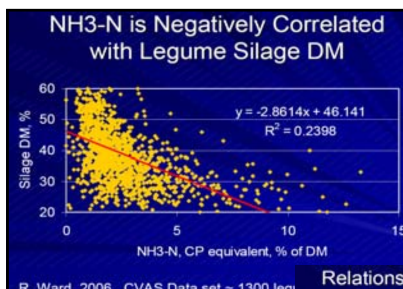


Continue to breed and select Improved varieties;

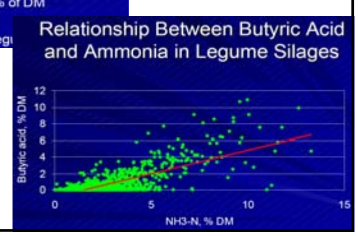
Address ensiling effects on quality



Kung ADSA 2006



Moisture at ensiling has a major affect on quality



Kung ADSA 2006

CUMBERLAND VALLEY ANALYTICAL SERVICES, INC. August 31, 200

PO Box 669 Maugansville, MD 21767 301-790-1980 Sample No : 622905

Acid Detergent Fiber	10.3	43.8	% DM
Neutral Detergent Fiber	13.9	59.0	% DM
Lignin / NDF Ratio		11.8	
Crude Protein	3.2	13.6	% DM
NDF 30 hr digestibility		39.4	% NDF
Ash	3.9	16.6	% DM
pH		5.7	
Lactic acid	0.2	0.8	% DM
Acetic acid	1.07	4.56	% DM
Butyric acid	1.38	5.86	% DM
Ammonia		63.0	% CP
Moisture	76.4		%
Dry Matter	23.6		%

Sample : RYE SILAGE

Methods to Decrease the Extent of Proteolysis During Ensiling

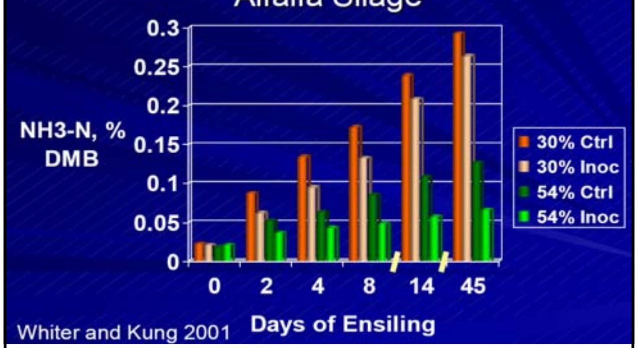
- Restricting fermentation
  - fast wilting to attain 40% DM (wide swath)
  - acidification (not practiced in US)

Methods to Decrease the Extent of Proteolysis During Ensiling

- Additives
  - treatment with acids
  - ammoniation
  - microbial inoculation
  - exogenous protease inhibitors: experimental only

Kung ADSA 2006

Example of the Effect of DM and Microbial Inoculation on Accumulation of NH3-N in Alfalfa Silage



Whiter and Kung 2001

Kung ADSA 2006

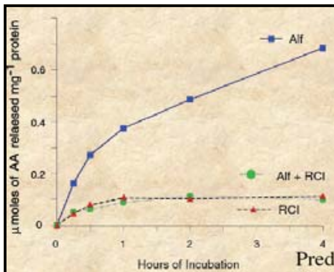
Methods to Decrease the Extent of Proteolysis During Ensiling

- Plant modification
  - Polyphenol Oxidase System
  - Low Levels of Tannins

Polyphenol Oxidase (PPO) System

- Red clover has up to 90% less proteolysis than alfalfa during ensiling (Jones et al., 1995, 1996)
  - Alfalfa lacks significant levels of endogenous foliar PPO and diphenols

Kung ADSA 2006



7 fold less protein breakdown during ensiling with PPO modified alfalfa

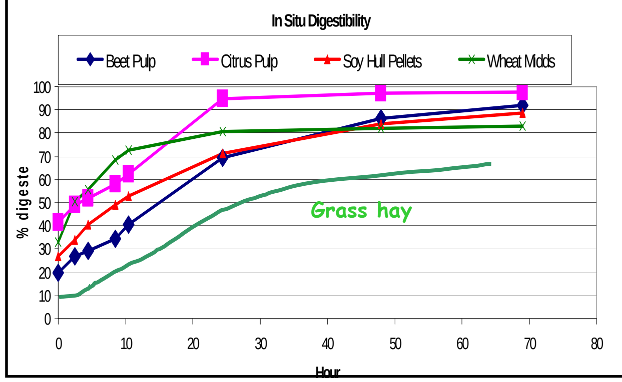
Predicted annual farm performance if alfalfa is fed as ~ 45% of the diet

	Net return $/cow	Milk yield kg/cow	Soybean fed kg/cow	Maize fed kg/cow	Total N loss kg/cow
Normal alfalfa	1,145	12,330	1026	2433	157
Tannin alfalfa	1,270	12,540	436	3060	118
Tannin impact	+125	+210	-590	+627	-39

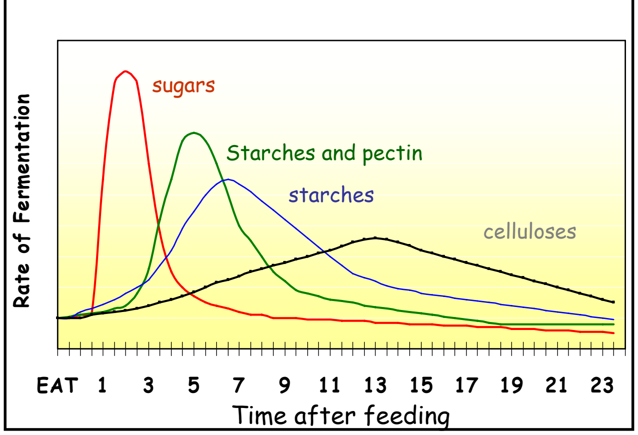
Alfalfa with higher level Tannin retains more native protein, less is broken down in ensiling, less SBM, more profit

Hatfield ADSA 2006

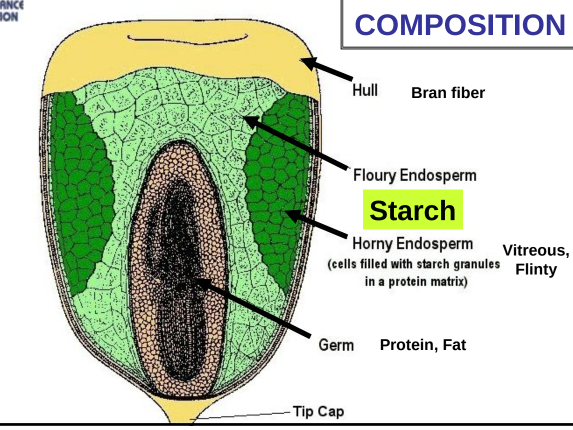
If Forage quality is limiting, use Non Forage Fiber Sources



Ruminal Feed Carbohydrate Fermentation Profile



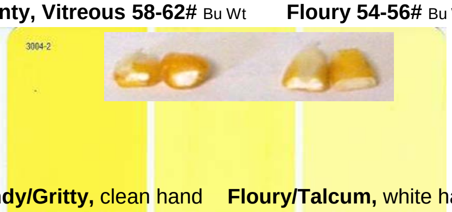
CORN COMPOSITION



Starch Availability Field Tests

Weigh **Flinty, Vitreous 58-62#** Bu Wt **Floury 54-56#** Bu Wt

Look – Paint Chip



Feel **Sandy/Gritty,** clean hand **Floury/Talcum,** white hand

Corn Source Example

- Knowlton et. al., Va Tech - 2002 Mid-lactation cows, Rations were 61% forage
- 25% starch; dry,ground vs steam-flaked corn

Steam Flaked Corn:

- Similar milk production (70-75 lbs.) but lower DMI; Higher Feed Efficiency (1.4 vs. 1.35)
- Increased ration DM and starch digestibility
- Lower MUN's; Decreased N excretion
- Lower rate of ammonia emission

Lab Digestibility$_{DSA}$ - Degree of Starch Access

Shaver NRAES-181

- Test Sample "as is" - unground, undried
- Water, buffer, enzyme heat, stir, test it
- Express "available" starch to total starch
- Compare DSA to "in the cow" digestion = Starch Digestibility$_{DSA}$

Starch Dig.$_{DSA}$	Reference
> 96	Very high
93 – 96	High
90 – 93	Medium
< 90	Low

Dry Corn Range 98 very fine grind vs 84 cracked corn
@10 # grain = 3 # milk

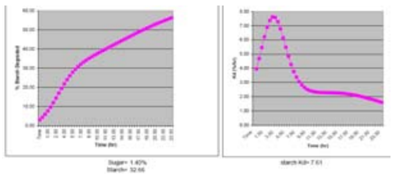
Corn Silage Range 98 vs 80
@ 15# CS DM = 2.5# milk

Other Lab Tests

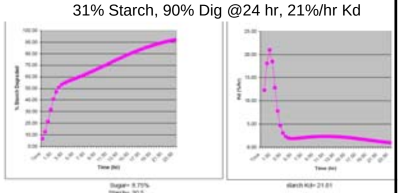
- DairyLand – In Vitro Starch Digestibility
- CVAS – Enzyme available starch (CPM utility evaluation in progress)

Starch Pools & Rates in CS - Gas Release

33 % Starch, 56% Dig @24 hr, 7.6 %/hr Kd



31% Starch, 90% Dig @24 hr, 21%/hr Kd



Optimize Yield & Components

	Total = NDF + A2 + B1 + B2		B1 = Starch			A2 = Sugar				
	NDF = B3 + C + NDIP		B2 = Soluble Fiber							
	Carbohydrate Fermentability									
	Total		NDF		B1		B2		A2	
Ingredient	%DM	lb	%NDF	lb	%B1	lb	%B2	lb	%A2	lb
Corn Silage	44.79	4.48	39.11	1.63	87.65	1.76	87.65	0.39	98.34	0.69
Mixed Silage	34.69	5.10	42.98	2.95	88.09	0.98	88.09	0.64	98.40	0.53
HM Corn	59.66	9.57	35.33	0.77	81.55	8.60	81.55	0.07	96.72	0.14
Citrus Pulp Grnd	56.19	2.56	35.29	0.31	88.49	0.04	84.33	1.02	98.18	1.18
Soybean ML 47.5 Solv	25.85	0.57	42.90	0.06	78.32	0.23	78.32	0.25	97.75	0.03
Grass Hay	41.69	0.56	45.53	0.34	88.72	0.02	88.72	0.15	98.50	0.05
AlfHay 20Cp37Ndf17LNDF	39.18	0.53	26.69	0.12	86.89	0.02	86.89	0.27	98.22	0.12
Dairy Supp 022403	6.26	0.17	0.00	0.00	70.39	0.14	0.00	0.00	97.26	0.03
Ration	44.44	23.53	36.19	6.18	82.73	11.78	85.43	2.80	98.18	2.77

Fermentable Cho=42-44% of DMI

>35%

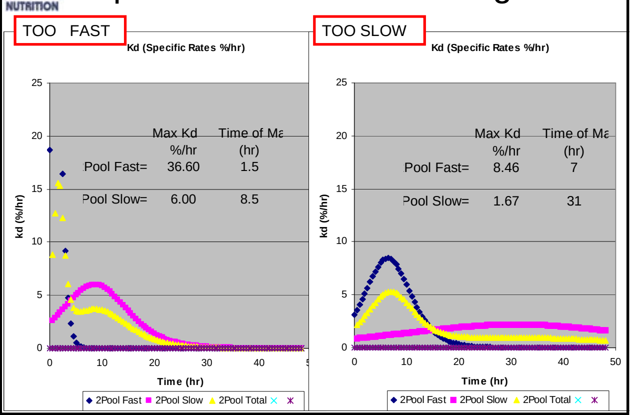
20-22% of DM

6-10% of DM

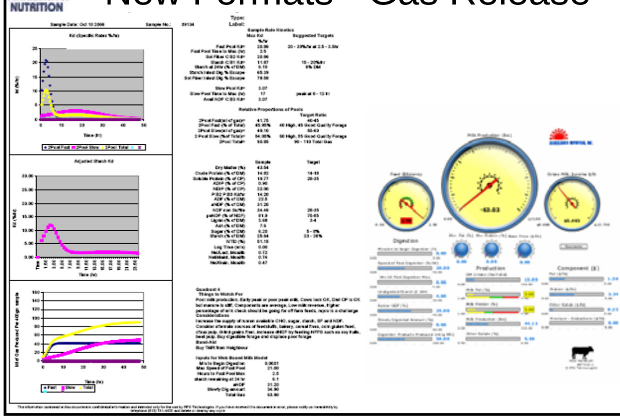
Adapted from Wm Chalupa

4-6% of DM

Optimize TMR Rates of Digestion



New Formats - Gas Release



Estimating Nutrient losses with CPM; P & N Balance Tab

CPM Dairy Ration Analyzer v3.0.8

File Edit Preferences View Action Help

Imperial | As Fed

LACTATING: BW=1620 lb,Growth=0.17 lb/d,Milk=85.00 lb,Fat=3.80%,TP=3.15

CNCPS | Amino Acids | MinVit | Met E & P | P & E | Diet Summary | Prot Pools | Carb | Fatty Acids | P & N Bal

Fraction	Phosphorus g/d	Phosphorus % Intake	Nitrogen g/d	Nitrogen % Intake
Intake	87.4	100.0	639.7	100.0
Growth	0.5	0.6	1.8	0.3
Pregnancy	0.0	0.0	0.3	0.0
Milk	38.5	44.1	204.8	32.0
Urine	1.5	1.7	176.9	27.7
Feces	46.9	53.7	256.0	40.0
Manure	48.4	55.4	432.8	67.7

P or N efficiency = 100 - % Intake value

Ex: 100 – 67.7 = 33.3% N Eff

100 – 55.4 = 44.6% P Eff

Session: 85lb Template 022207 Demo Alf hi

Feed Name	Amount
CrnSilUp35Dm41NdfCrse	45.000
MixSil18Cp48Ndf12LNdf	0.000
AlfSil25Cp35Ndf15LNdf	45.000
CornGrainGrndMed	12.000
SoybeanML47.5Solv	2.250
CornDistEthanol	2.500
Turbo Meal	4.500
BloodMeal	0.400

Met E & P Tab

Diet CP	19.8	% DM
RDP	63.9	% CP
RDP	12.6	% DM
Soluble Protein	40.4	% CP
Predicted PUN	23	mg %
Predicted MUN	19	mg %
Pept & NH3 Bal	194 g/d	154 %
Pept Bal	3 g/d	102 %
Urea Cost	0.843 mCal/d	

P & N Tab

Fraction	Phosphorus g/d	Phosphorus % Intake	Nitrogen g/d	Nitrogen % Intake
Intake	84.4	100.0	741.1	100.0
Growth	0.5	0.6	1.8	0.2
Pregnancy	0.0	0.0	0.3	0.0
Milk	38.5	45.6	204.8	27.6
Urine	1.5	1.8	289.1	39.0
Feces	43.9	52.0	245.2	33.1
Manure	45.4	53.8	534.2	72.1

Nitrogen Eff = 27.9

Session: 85lb Template 022207 Demo hi N

Feed Name	Amount
CrnSilUp35Dm41NdfCrse	30.000
MixSil18Cp48Ndf12LNdf	50.000
CornGrainGrndMed	11.000
CanolaMealSolv	2.000
SoybeanHullsGrnd	2.000
CitrusPulpDry	2.000
Turbo Meal	2.500
SoybeanML47.5Solv	4.000
BloodMeal	0.250
Megalac	0.400

Diet CP	18.5	% DM
RDP	64.3	% CP
RDP	11.9	% DM
Soluble Protein	33.4	% CP
Predicted PUN	21	mg %
Predicted MUN	18	mg %
Pept & NH3 Bal	153 g/d	140 %
Pept Bal	56 g/d	129 %
Urea Cost	0.583 mCal/d	

Fraction	Phosphorus g/d	Phosphorus % Intake	Nitrogen g/d	Nitrogen % Intake
Intake	86.8	100.0	712.1	100.0
Growth	0.5	0.6	1.8	0.3
Pregnancy	0.0	0.0	0.3	0.0
Milk	38.5	44.4	204.8	28.8
Urine	1.5	1.7	256.3	36.0
Feces	46.3	53.4	249.0	35.0
Manure	47.7	55.0	505.3	71.0

Nitrogen Eff = 29

Session: 85lb Template 022207 Demo

Feed Name	Amount
CrnSilUp35Dm41NdfCrse	67.377
MixSil18Cp48Ndf12LNdf	20.000
CornGrainGrndMed	4.953
CanolaMealSolv	4.000
SoybeanHullsGrnd	3.692
CitrusPulpDry	3.539
Turbo Meal	2.759
SoybeanML47.5Solv	1.570
CornHominyHiFat	1.529
BloodMeal	0.700
Megalac	0.667

Diet CP	16.4	% DM
RDP	58.9	% CP
RDP	9.7	% DM
Soluble Protein	30.1	% CP
Predicted PUN	18	mg %
Predicted MUN	15	mg %
Pept & NH3 Bal	75 g/d	120 %
Pept Bal	21 g/d	111 %
Urea Cost	0.005 mCal/d	

Fraction	Phosphorus g/d	Phosphorus % Intake	Nitrogen g/d	Nitrogen % Intake
Intake	87.4	100.0	638.9	100.0
Growth	0.5	0.6	1.8	0.3
Pregnancy	0.0	0.0	0.3	0.0
Milk	38.5	44.1	204.8	32.1
Urine	1.5	1.7	176.1	27.6
Feces	46.9	53.7	255.9	40.1
Manure	48.4	55.4	432.0	67.6

Nitrogen Eff = 32.4

Cornell N Excretion Calculator

Herd totals	lb	Proportion
Home raised N	41425	63.2% home raised
Purchased N	24172	36.8% purchased
Milk N	15103	91.6% of total product
Preg. N	225	1.4% of total product
Gain N	1159	7.0% of total product
Total Product N	16488	
Product N / Intake N (Efficiency)		25%
Efficiency goal	>	35%
Total N excreted (whole herd)	48852	74.5% of total N intake
Urinary N, lb.	21025	
Fecal N, lb.	27827	

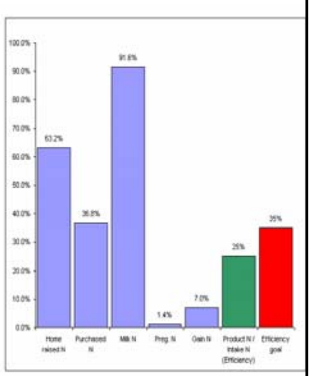
stimated % urinary N in manure N:

actating cows, 40-50%; heifers and dry cows, 35-40%.

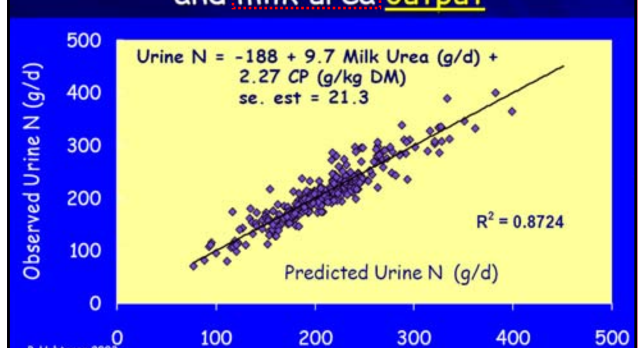
N volatilized in barn total (lb)	3,908
N volatilized in barn daily (lb)	11

Estimates of % of N in manure that is volatilized on the barn floor

	Barn temperature, degrees F			
Scrape interval, hr	68	Annual	50	40
6	10	4	1	0
12	19	8	2	1
24	35	16	5	2
48	38	20	10	5
72	39	22	14	6



Prediction of urine N (Feed N - Fecal N - Milk N) from dietary CP concentration and milk urea output



Huhtanen ADSA 2006

Not Just Lactating Cows; Heifer Ammonia Emissions

- Dairy heifers (James et. al., 1999)
- Decreased ration N by 14%
- Decreased N in manure by 13%
- Decreased ammonia emissions by 28%

Dr Heinrichs will report on restricted feeding heifers and improved feed efficiency at this meeting

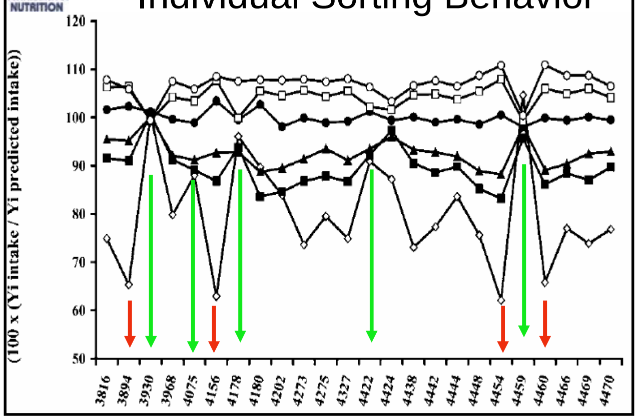
Forage Harvesting Storage & Processing

Grain Processing

Moisture, particle size, heating, flaking affect rate

Mixing & Feeding Management

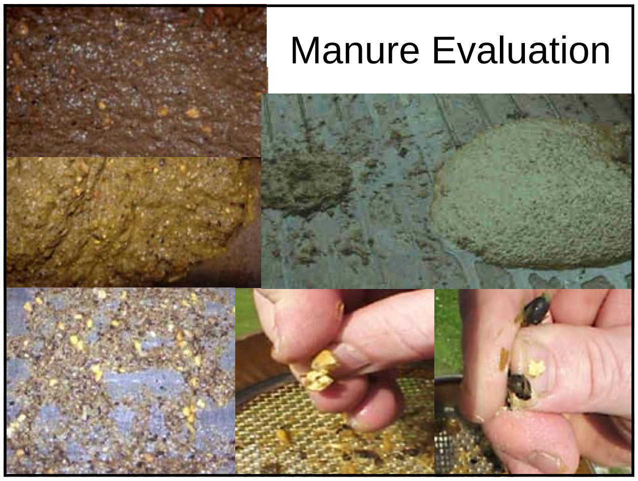
Individual Sorting Behavior



WAYS TO IMPROVE FEED EFFICIENCY

- ✓ Minimize Feed Wastage at the Bunk
- ✓ Minimize Birds, Pests and Parasites
- ✓ Minimize Illness and Disease
- ✓ Minimize Feeding Spoiled or Low Digestibility Feeds
- ✓ Proper Feed Processing
- ✓ Extended Day Lighting
- ✓ Grouping Heifers Separate from Cows
- ✓ Balancing diets for amino acids
- ✓ Monensin
- ✓ Improve Trace Mineral Status
- ✓ rbST, Yeast Culture, Cow Comfort

Manure Evaluation



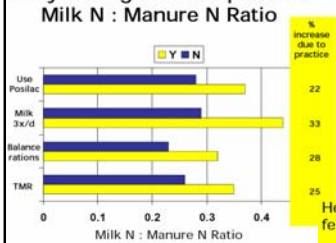
What happens to manure N?

(% of excreted N)

- Lost as ammonia (20-40%)
- Taken up by plants (20-40%)
- Lost via nitrate leaching (10-20%)
- Lost via denitrification (3-5%)
- Immobilized by soil microorganisms (?)

Powell ADSA 2006

Dairy management impacts on Milk N : Manure N Ratio



% increase due to practice
22
33
28
25

Management practices that increase production may increase N use efficiency

Herd size impacts on milk production and feed N use efficiency (FNUE)
54 Wisconsin dairy farms

Larger farms (adopted more management tools ?) had improved N use efficiency

Lactating cows/farm	Milk Production (kg/cow/d)	FNUE (%)
1-29	20.0c	18.2c
30-49	27.4b	24.2b
50-99	29.7b	26.6b
100-199	33.1ab	24.3b
200+	38.7a	32.6a

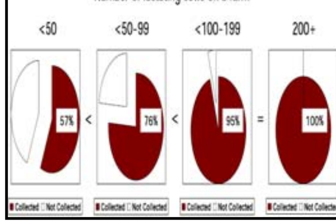
Powell ADSA 2006

RENAISSANCE NUTRITION

Herd size differences in manure collection on 54 Wisconsin dairy farms

More Manure is collected in free stalls

Number of lactating cows on a farm



Larger farms are collecting more manure

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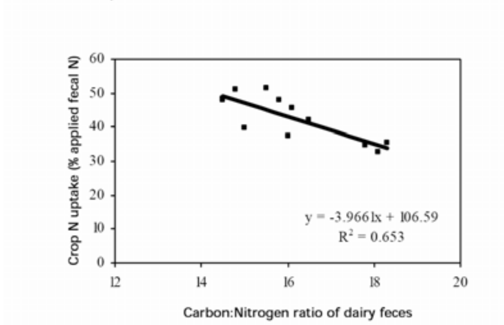
Relationship between Carbon:Nitrogen ratio of dairy feces and net crop N uptake in silt loam soil (each data point = one diet)



Lower Manure C:N ratio = Higher Crop N Uptake

Powell ADSA 2006

Lower Manure C:N ratio = Higher Crop N Uptake & ***Feeding affects C:N ratio***

LCP=15.1%
HCP=18.4%
HF NDF=36%
MF NDF=32%
LF NDF=28%

Feed components		TC	TN	NDF	NDIN	C:N
LCP	HF	451	27.0	571	6.5	17.8
HCP	HF	447	29.4	564	7.3	14.7
LCP	MF	462	27.6	538	6.6	16.0
HCP	MF	453	29.4	599	7.8	16.5
LCP	LF	457	28.6	526	6.6	11.7
HCP	LF	460	30.5	512	506	14.5

CS= Corn Silage
AS= Alfalfa Silage
LP= 16.7%
HP= 17.8%

Feed components		TC	TN	NDF	NDIN	C:N
CS	LP	448	28.4	570	8.3	15.5
CS	HP	454	28.2	537	6.4	14.8
AS	LP	444	24.4	545	4.8	18.3
AS	HP	439	24.4	561	5.3	18.1

Cornell Whole Farm Study

- Central NY free-stall dairy herd
- 1997 to 2002
- This herd was used as a case study by our Cornell Nutrient Management group
- Shifts have been made in crops grown, forage storage, rations and feeding management practices

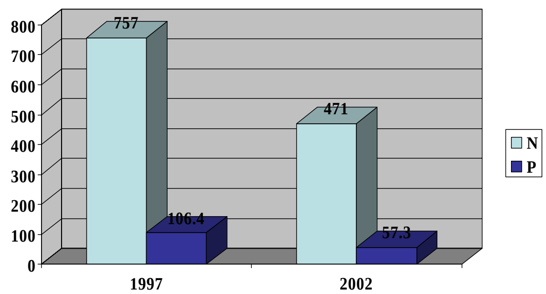
Whole Farm Case Study

	1997	2002
Milk cows	408	544
Milk, lbs/cow	67	74
Calv. Int., mo.	13*	12.8
Age, 1st calv	22.6*	21.5
Cull rate, %	42.2	23.3
Purch. Feed, $/cow/day	2.13	1.28

Whole Farm Case Study

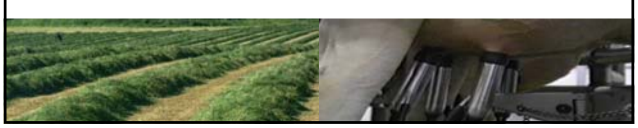
	1997	2002
Ration, % homegrown	42.9	59.1
N purch., %	81	51
P purch., %	78	47
N eff., %	19	25
P eff., %	25	35

Nutrient Excretion, lbs./cow/year



Nutronomy Goals

- Optimize DM Intake, milk yield & components
- Optimize forage intake, control costs
- Ensure adequate fiber mat & cow health
- Balance carbohydrate and protein fractions
- Optimize fermentation & rumen bug protein
- Increase feed efficiency & minimize environmental loss and waste



Dairy and the Environment

2007 Bucknell Conference

Dr. Tim Snyder

Renaissance Nutrition