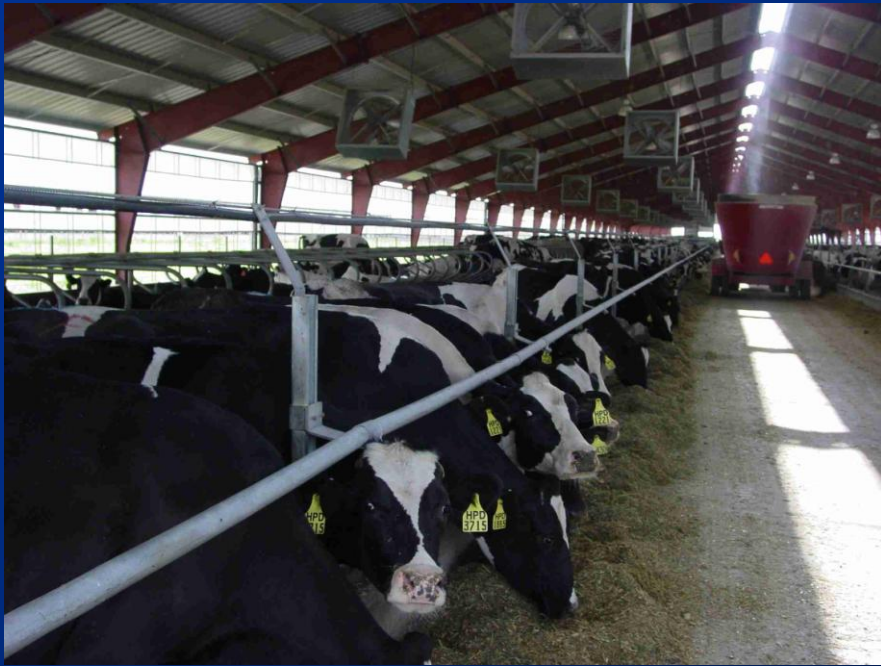


Forage Based Dairy Nutrition



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Agri-King Nutritionist

Forage Expo
July 17, 2014

High Quality Forage

- Need to develop passion for obtaining high quality forages
- Forage quality is the basis for both efficient and profitable milk production
- Forage quality is determined by management
- Forages are the most economical source of nutrients on the farm
 - SBM - \$0.27 per lb protein (\$498/ton SBM – 6/4/14)
 - Haylage - \$0.10 per lb protein (\$60/ton haylage)
- Treating forages can improve nutrient availability
- Forage quality can not be too good!

High Quality Forage

- Essential for rumen health.
- Major source of fiber (lets make it digestible).
- Nutritional value more variable than conc.
- Should be analyzed for nutrients.
- Field and storage losses of nutrients can be high.
- Properly grown, harvested and stored forage is an inexpensive source of nutrients.
- Excellent source of sugar, let the sun do its job!

Figures 1 and 2. The Feed Pyramid for Dairy Cows

Fig. 1

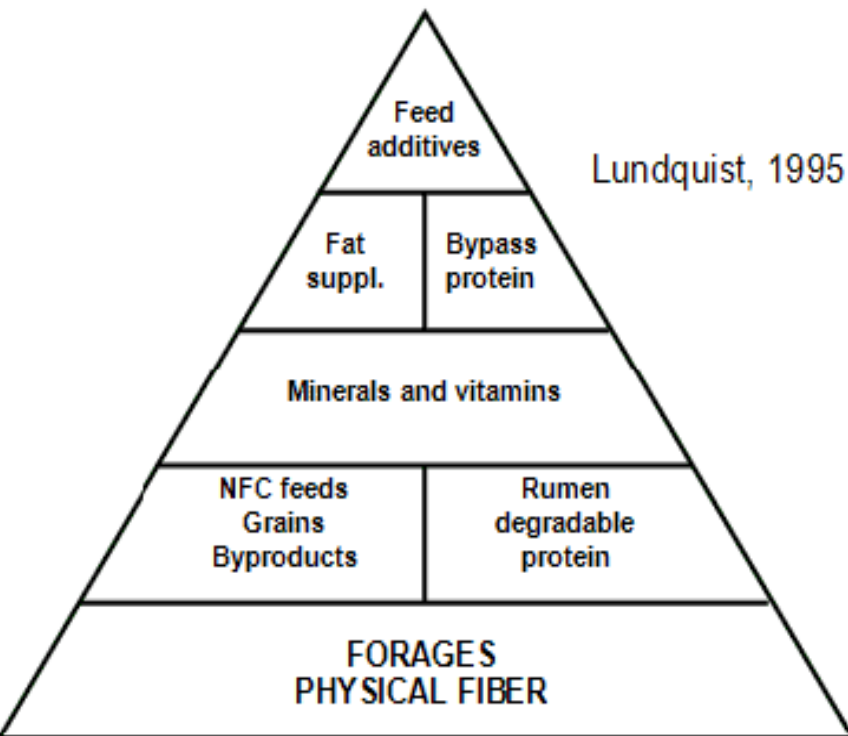
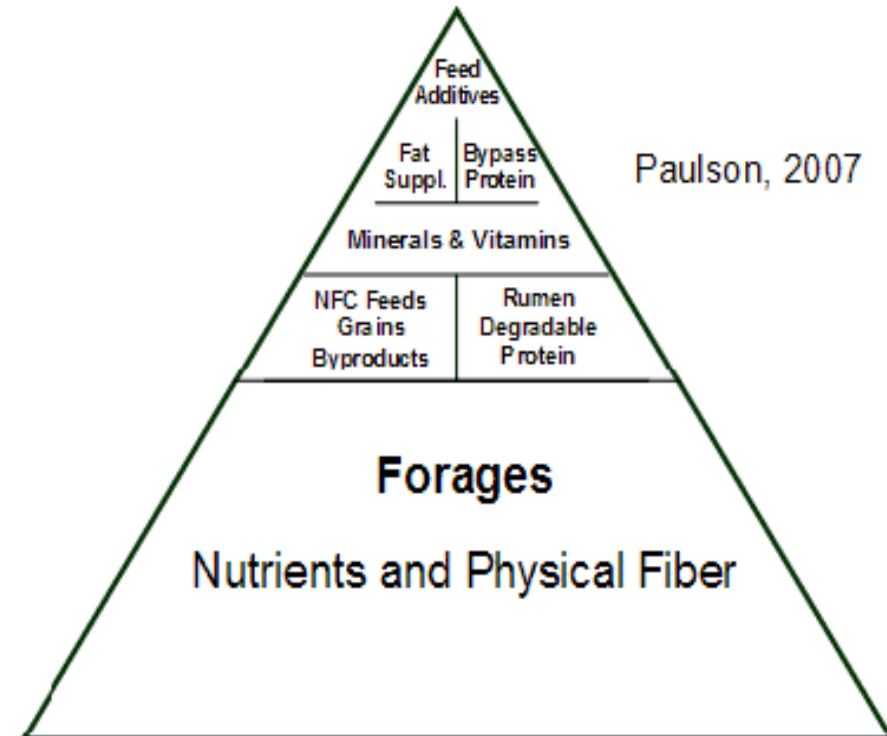
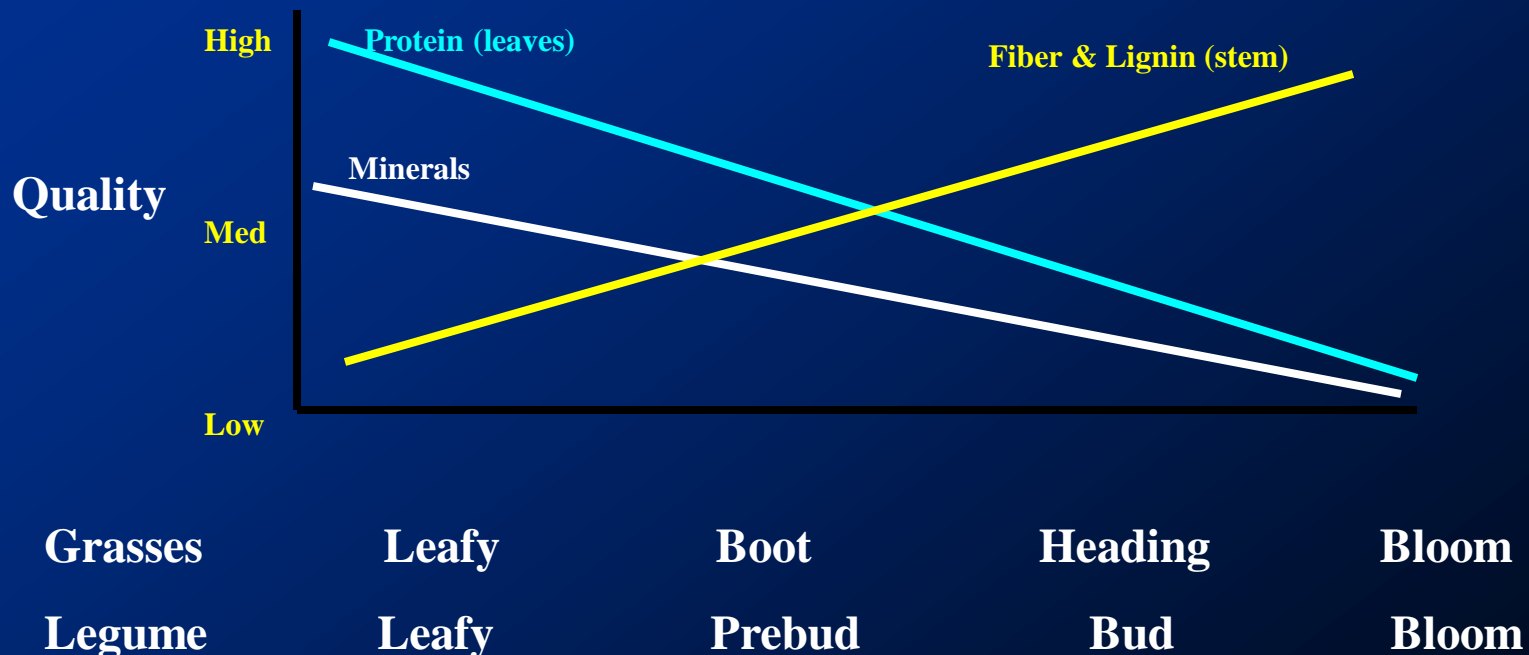


Fig. 2



FORAGE QUALITY

- Maturity
 - Number 1 factor affecting forage quality.



Plant Cell

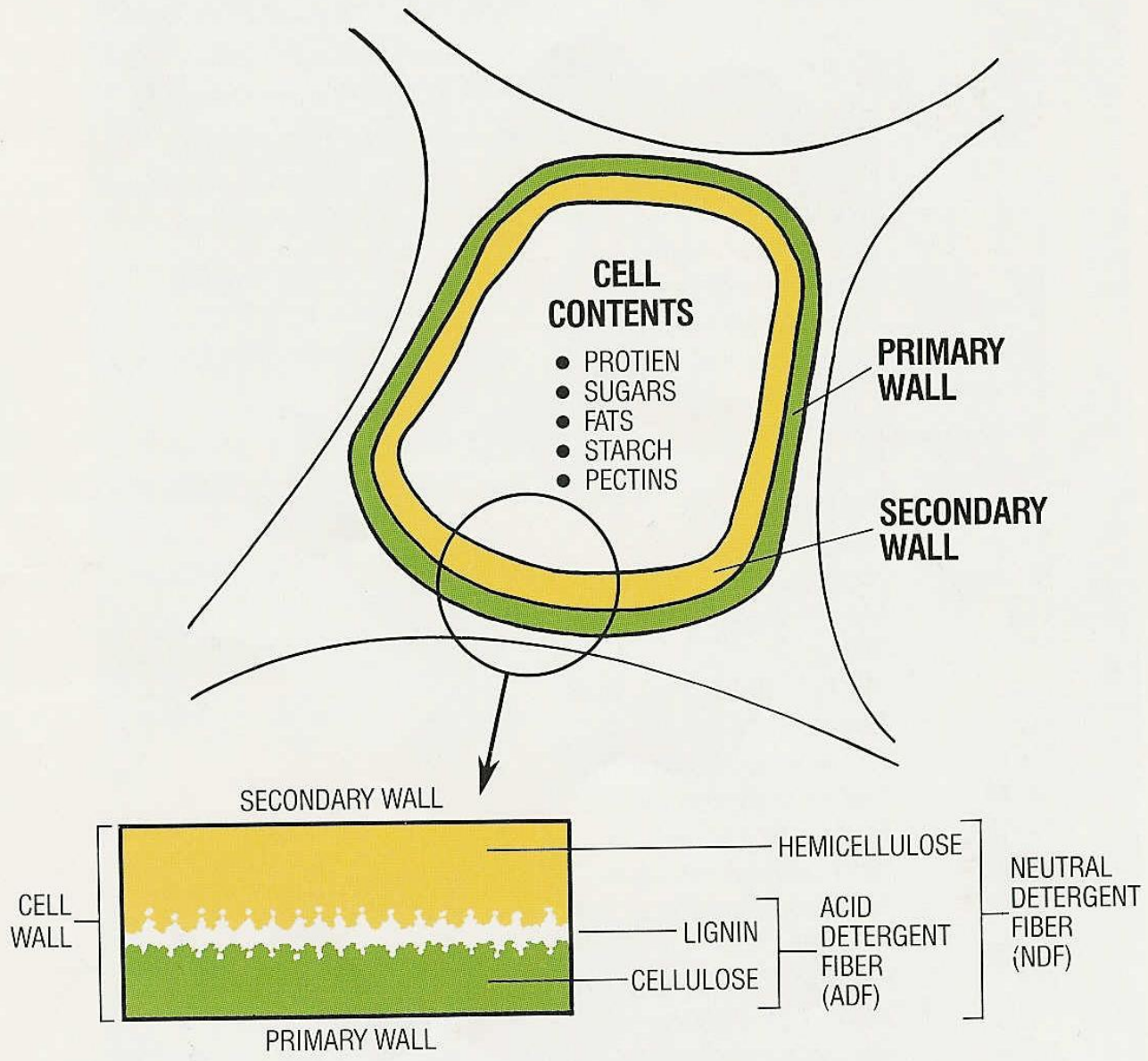
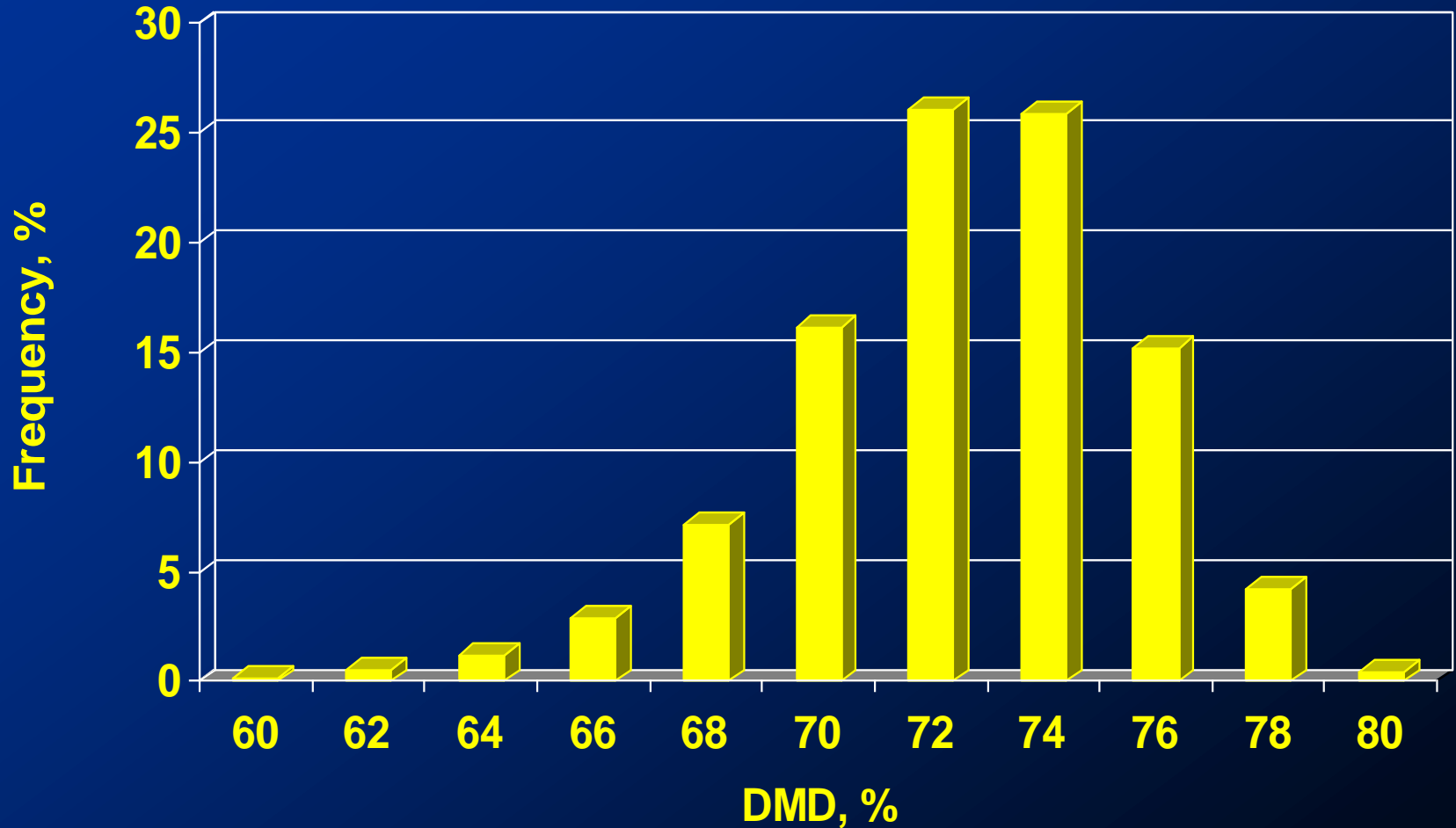
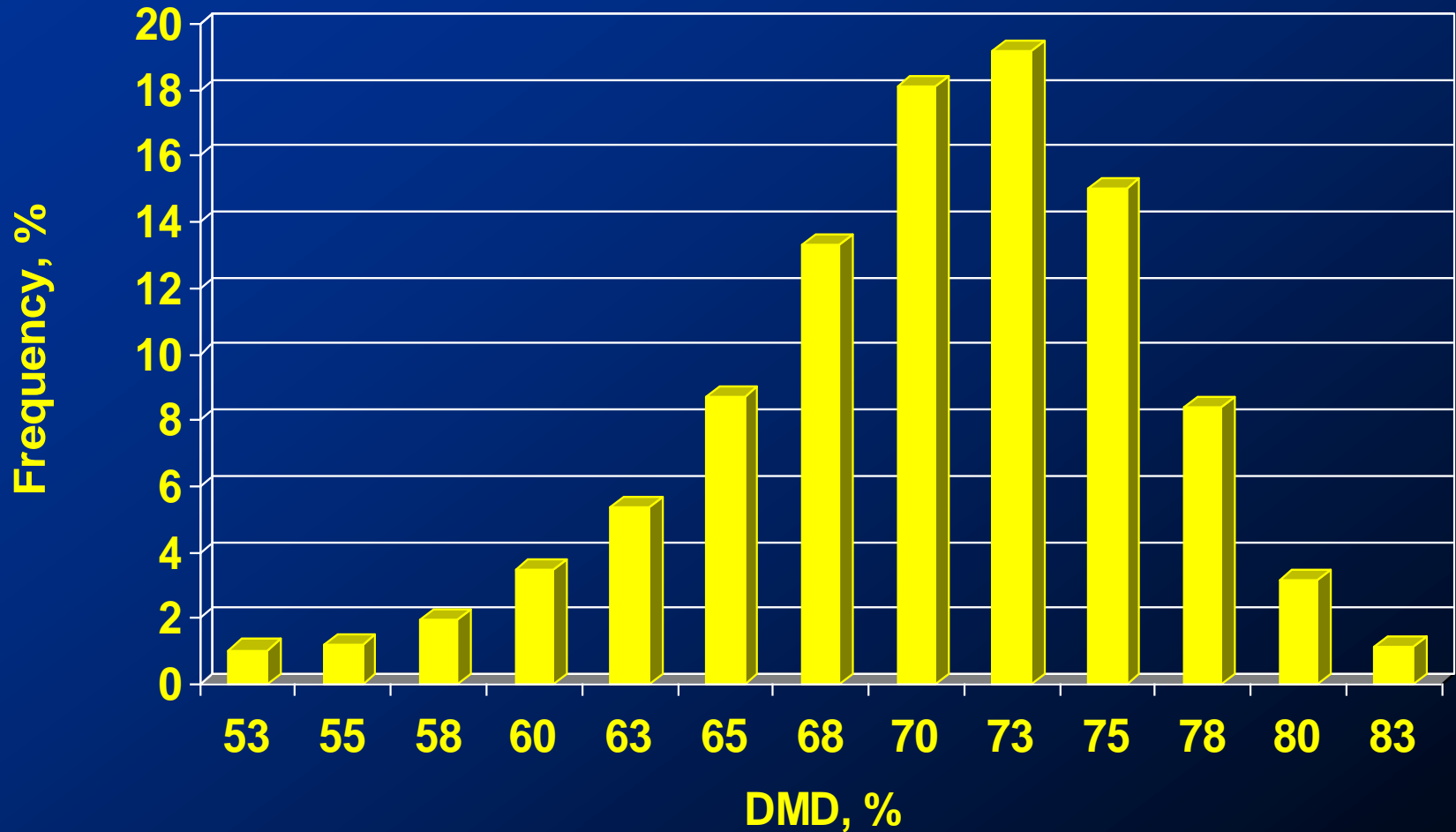


Figure 1. Diagram of a plant cell showing cell wall structure.

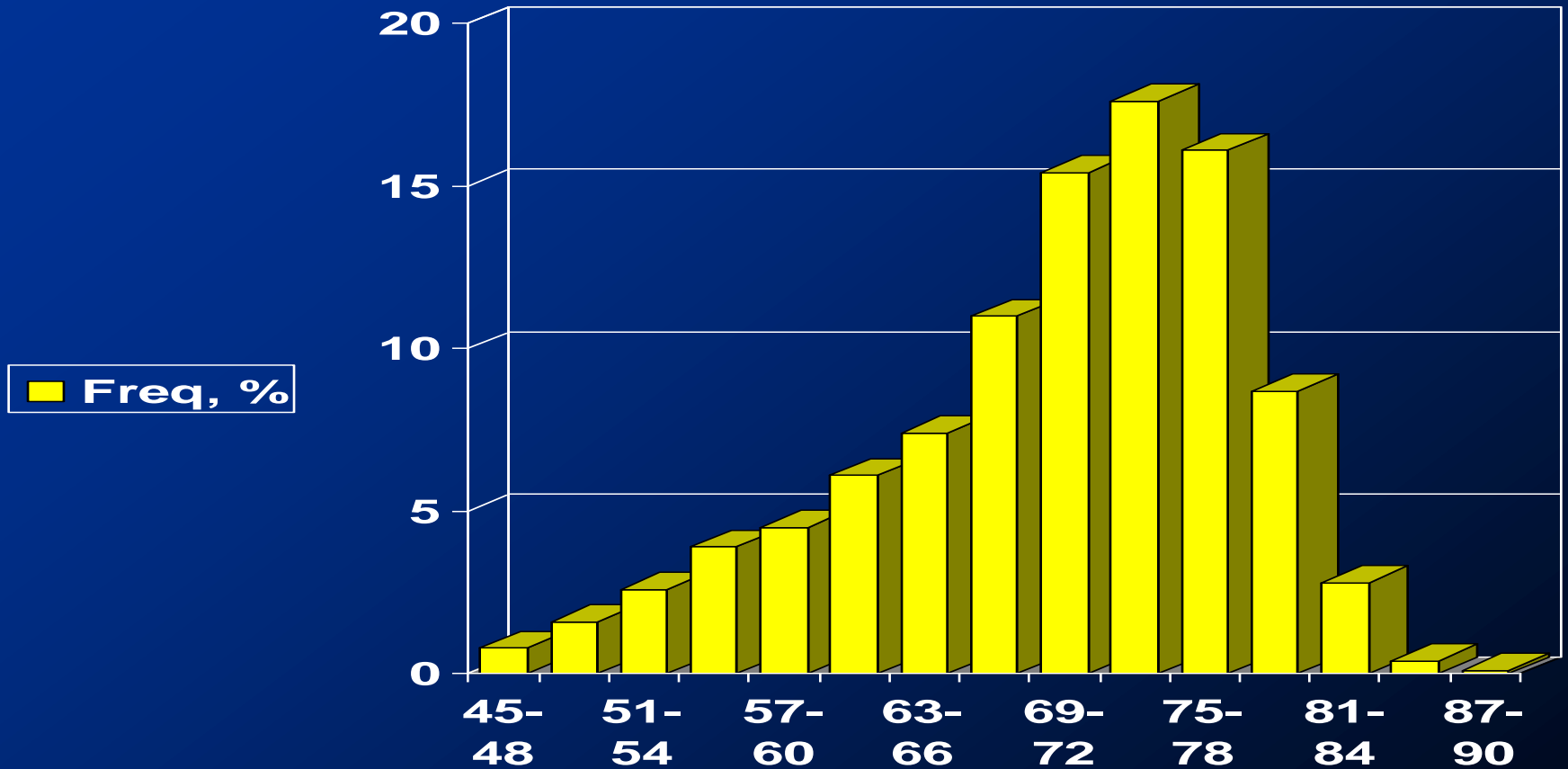
Frequency distribution of dry matter digestibility (DMD) in 30,422 corn silage samples



Frequency distribution of dry matter digestibility (DMD) in 29,817 haylage samples



Frequency distribution of IVDMD in 9357 hay samples



Why Digestibility?

Haylage 20% CP, 30% ADF, 40% NDF

RFV = 152

Nutrient	Mean	Min	Max	CV
IVDMD	74.1	66.8	77.5	2.80
NDFd	59.1	53.1	64.2	6.87

80 LBS MILK; 47 LBS DMI; HAYLAGE COMPARISON

	<u>AS FED 1</u>	<u>AS FED 2</u>
GRAIN	25.71	23.92
HAYLAGE	30.47 (73.25% IVDMD, 24% CP)	33.60 (78.87% IVDMD, 26% CP)
CORN SILAGE (avg)	40.00	40.00

SHELL CORN	13.74	13.27
48 SBM	4.64	3.42
C. DISTILLERS	4.00	4.00
W. COTTONSEED	2.00	2.00
MAG OX	0.08	0.06
Na BICARB	0.08	
DICAL	0.13	0.132
CALCIUM	0.39	0.34
DYNAMATE	0.003	0.05
SALT	0.32	0.33
Se 0.02%	0.07	0.07
Ru-Mend	0.035	0.035
AK Dairy Premium	0.10	0.10

RATION NUTRIENT PROFILE

	<u>% OF DM 1</u>	<u>% OF DM 2</u>
CP	17.93	18.00
MAP	12.92	12.92
ADF	19.40	19.37
NDF	29.94	29.68
NDF-FORAGE	21.70	21.74
STARCH	27.19	26.58
NFC	40.65	40.93
RFC	35.20	35.29
RDC	24.54	24.80
MOISTURE	50.85	51.54
CALORIES	717 Kcal/lbs	717 Kcal/lbs
FORAGE:CONC	52:48	55:45

80 LBS MILK; 47 LBS DMI; HAYLAGE COMPARISON

	<u>Cost 1</u>	<u>Cost 2</u>	
GRAIN	\$3.53	\$3.19	
HAYLAGE	\$0.910 (\$60/Ton)	\$1.09 (\$65/Ton)	\$1.18 (\$70/ton)
CORN SILAGE (avg)	<u>\$1.00</u> (\$50/Ton)	<u>\$1.00</u> (\$50/Ton)	
Total Cost	\$5.44	\$5.28	\$5.37

SHELL CORN (\$150/ton)	\$1.03	\$0.99	
48 SBM (\$473/ton)	\$1.10	\$0.81	
C. DISTILLERS (\$185/ton)	\$0.37	\$0.37	
W. COTTONSEED (\$338/ton)	\$0.34	\$0.34	
MAG OX	\$0.012	\$0.0096	
Na BICARB	\$0.012		
DICAL	\$0.03	\$0.03	
CALCIUM	\$0.023	\$0.02	
DYNAMATE	\$0.0006	\$0.009	
SALT	\$0.026	\$0.026	
Se 0.02%	\$0.006	\$0.006	
Ru-Mend	\$0.13	\$0.13	
AK Dairy Premium	\$0.45	\$0.45	

80 LBS MILK; 47 LBS DMI; CORN SILAGE COMPARISON

	<u>AS FED 3</u>	<u>AS FED 4</u>
GRAIN	27.77	25.22
HAYLAGE (550926)	26.39	29.76
CORN SILAGE	40.00 (69% IVDMD, 31% ST)	40.00 (75.77% IVDMD, 40% ST)

SHELL CORN	14.65	12.87
48 SBM	5.50	4.89
C. DISTILLERS	4.00	4.00
W. COTTONSEED	2.00	2.00
MAG OX	0.08	0.09
Na BICARB	0.24	0.18
DICAL	0.15	0.11
CALCIUM	0.48	0.42
KCl	0.13	0.09
SALT	0.18	0.23
Se 0.02%	0.07	0.07
Ru-Mend	0.035	0.035
AK Dairy Premium	0.10	0.10

RATION NUTRIENT PROFILE

	<u>% OF DM 3</u>	<u>% OF DM 4</u>
CP	17.39	17.61
MAP	12.97	12.89
ADF	19.03	18.03
NDF	29.73	28.72
NDF-FORAGE	21.15	20.56
STARCH	27.90	28.81
NFC	40.65	42.04
RFC	37.00	38.55
RDC	26.52	27.99
MOISTURE	49.81	50.25
CALORIES	718 Kcal/lbs	718 Kcal/lbs
FORAGE:CONC	48:52	53:47

80 LBS MILK; 47 LBS DMI; CORN SILAGE COMPARISON

	<u>Cost 3</u>	<u>Cost 4</u>	
GRAIN	\$3.85	\$3.55	
HAYLAGE (550926)	\$0.79 (\$60/Ton)	\$0.89 (\$60/Ton)	
CORN SILAGE	<u>\$1.00</u> (\$50/Ton)	<u>\$1.1</u> (\$55/Ton)	\$1.2 (\$60/ton)
Total Cost	\$5.64	\$5.54	\$5.64

SHELL CORN (\$150/ton)	\$1.10	\$0.97	
48 SBM (\$473/ton)	\$1.30	\$1.16	
C. DISTILLERS (\$185/ton)	\$0.37	\$0.37	
W. COTTONSEED (\$338/ton)	\$0.34	\$0.34	
MAG OX	\$0.013	\$0.014	
Na BICARB	\$0.038	\$0.028	
DICAL	\$0.035	\$0.026	
CALCIUM	\$0.029	\$0.025	
KCl	\$0.024	\$0.017	
SALT	\$0.015	\$0.018	
Se 0.02%	\$0.006	\$0.006	
Ru-Mend	\$0.13	\$0.13	
AK Dairy Premium	\$0.45	\$0.45	

80 LBS MILK; 47 LBS DMI; HAY COMPARISON

	<u>AS FED 5</u>	<u>AS FED 6</u>
GRAIN	27.02	24.40
HAY	8.00 (73% IVDMD, 20% CP)	8.00 (80.36% IVDMD, 25% CP)
HAYLAGE (550926)	20.09	26.31
CORN SILAGE	25.00	25.00

SHELL CORN	15.67	14.58
48 SBM	3.97	2.55
C. DISTILLERS	4.00	4.00
W. COTTONSEED	2.00	2.00
MAG OX	0.08	0.07
Na BICARB	0.14	0.21
DICAL	0.12	0.12
CALCIUM	0.37	0.28
KCI	0.07	
SALT	0.23	0.21
Se 0.02%	0.07	0.07
Ru-Mend	0.035	0.035
AK Dairy Premium	0.10	0.10

RATION NUTRIENT PROFILE

	<u>% OF DM 5</u>	<u>% OF DM 6</u>
CP	17.80	18.00
MAP	12.92	12.92
ADF	19.36	19.56
NDF	29.50	30.36
NDF-FORAGE	21.04	22.34
STARCH	26.34	24.92
NFC	41.12	40.23
RFC	38.46	37.12
RDC	27.35	26.58
MOISTURE	41.01	43.54
CALORIES	716 Kcal/lbs	716 Kcal/lbs
FORAGE:CONC	50:50	55:45

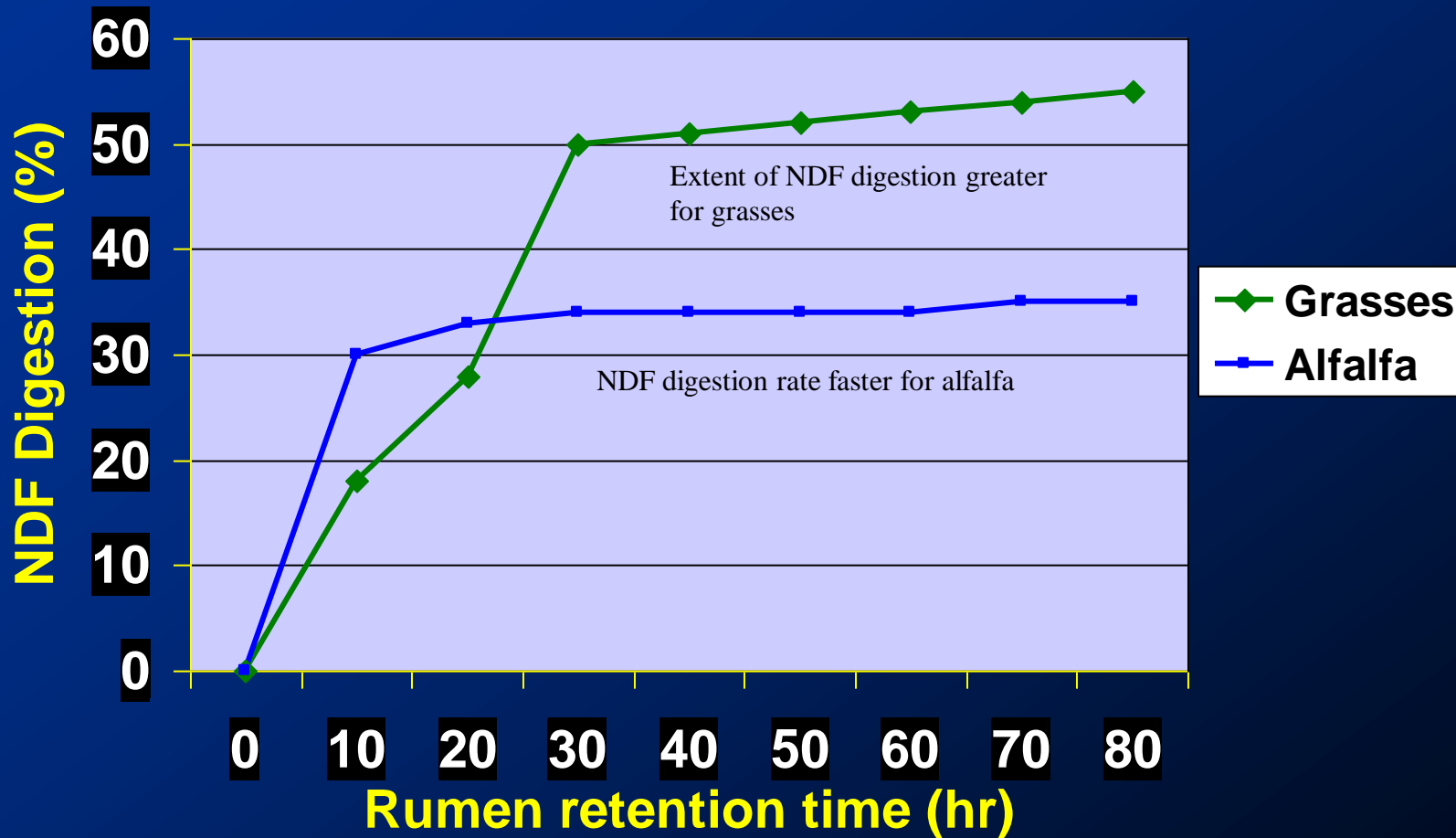
80 LBS MILK; 47 LBS DMI; HAY COMPARISON

	<u>Cost 5</u>	<u>Cost 6</u>	
GRAIN	\$3.53	\$3.10	
HAY	\$0.96 (\$240/Ton)	\$1.12 (\$280/Ton)	\$1.2 (\$300/Ton)
HAYLAGE (550926)	\$0.60 (\$60/Ton)	\$0.79 (\$60/Ton)	
CORN SILAGE	<u>\$0.62</u> (\$50/Ton)	<u>\$0.62</u> (\$50/Ton)	
Total Cost	\$5.71	\$5.63	\$5.71

SHELL CORN (\$150/ton)	\$1.18	\$1.10
48 SBM (\$473/ton)	\$0.94	\$0.60
C. DISTILLERS (\$185/ton)	\$0.37	\$0.37
W. COTTONSEED (\$338/ton)	\$0.34	\$0.34
MAG OX	\$0.013	\$0.012
Na BICARB	\$0.022	\$0.033
DICAL	\$0.028	\$0.028
CALCIUM	\$0.022	\$0.017
KCI	\$0.013	
SALT	\$0.019	\$0.017
Se 0.02%	\$0.006	\$0.006
Ru-Mend	\$0.13	\$0.13
AK Dairy Premium	\$0.45	\$0.45

Extent of NDF digestion in the Rumen

(adapted from Mertens, 1977)



University of Minnesota study (Hoard's Dairyman, June 2014)

- Organic cow study
- No grain, low grain (6 lbs), high grain (12 lbs).
- No grain – 100% pasture
- Low & high grain – 25 lbs CS, 20 lbs alf haylage, 1.5 lbs mineral.

Mention: consistent supply of high quality forage, Supplemented feeds complement pasture forage, energy and RDP may not be met with forage alone.

Less organic grain led to more profit

(Adapted from Heins, Hoard's Dairyman, June 2014)

	No grain (0lbs)	Low grain (6 lbs)	High grain (12 lbs)
<u>Measurement</u>	<u>Mean</u>	<u>Mean</u>	<u>Mean</u>
Milk (lbs)	32.2	40.4	39.4
Fat (%)	3.82	3.78	3.38
Protein (%)	3.20	3.24	3.20
ECM (lbs)	32.2	37.2	36.3
MUN (mg/dl)	14.25	10.06	7.33
BCS	2.98	3.09	3.15
TMR cost (\$)	0.0	3.18	4.21
Pasture cost (\$)	1.02	0.87	0.86
Prod. Revenue (\$)	5.02	6.35	5.53
IOFC (\$)	3.61	2.20	0.38
**study based on organic	market prices		

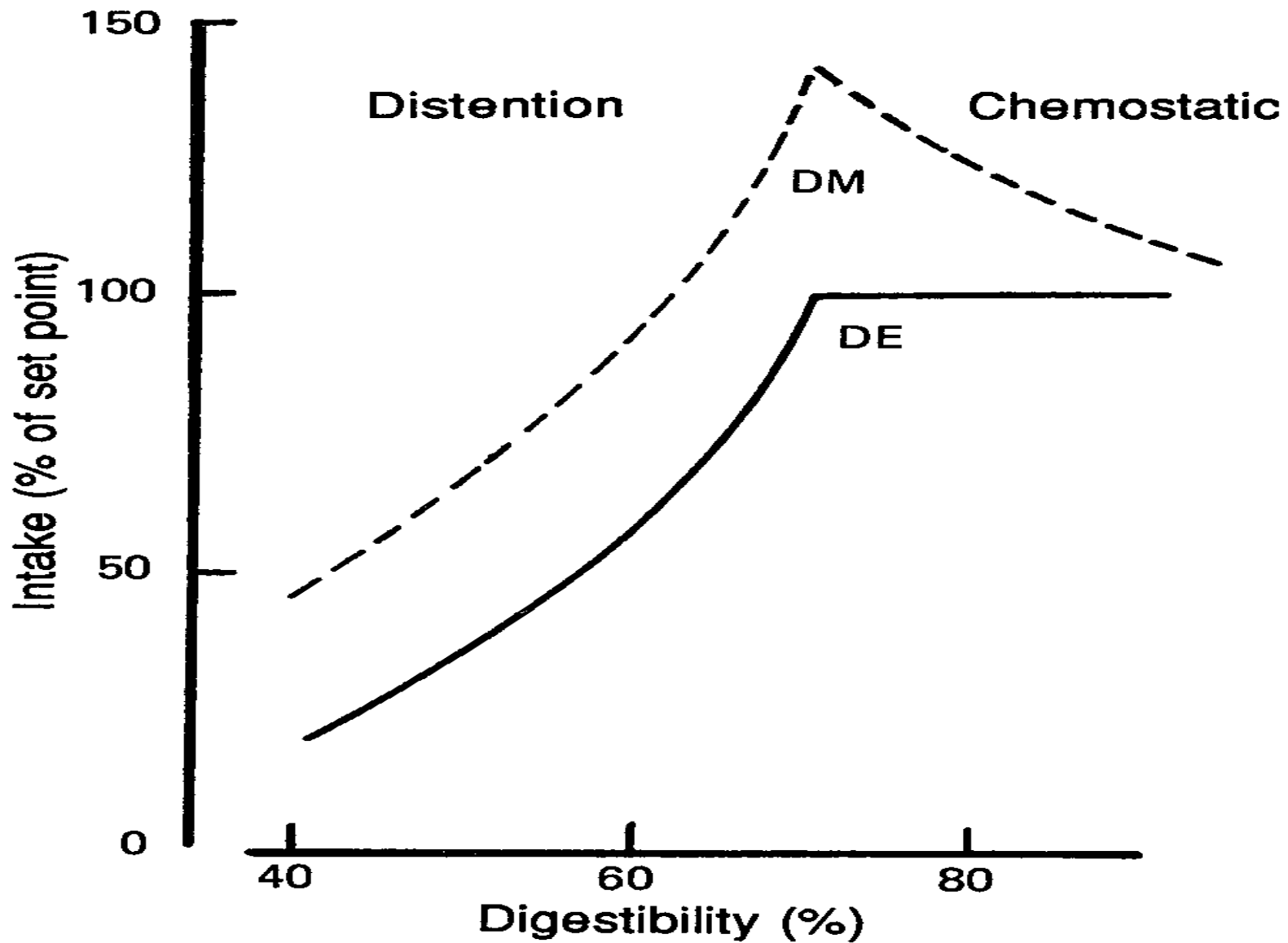
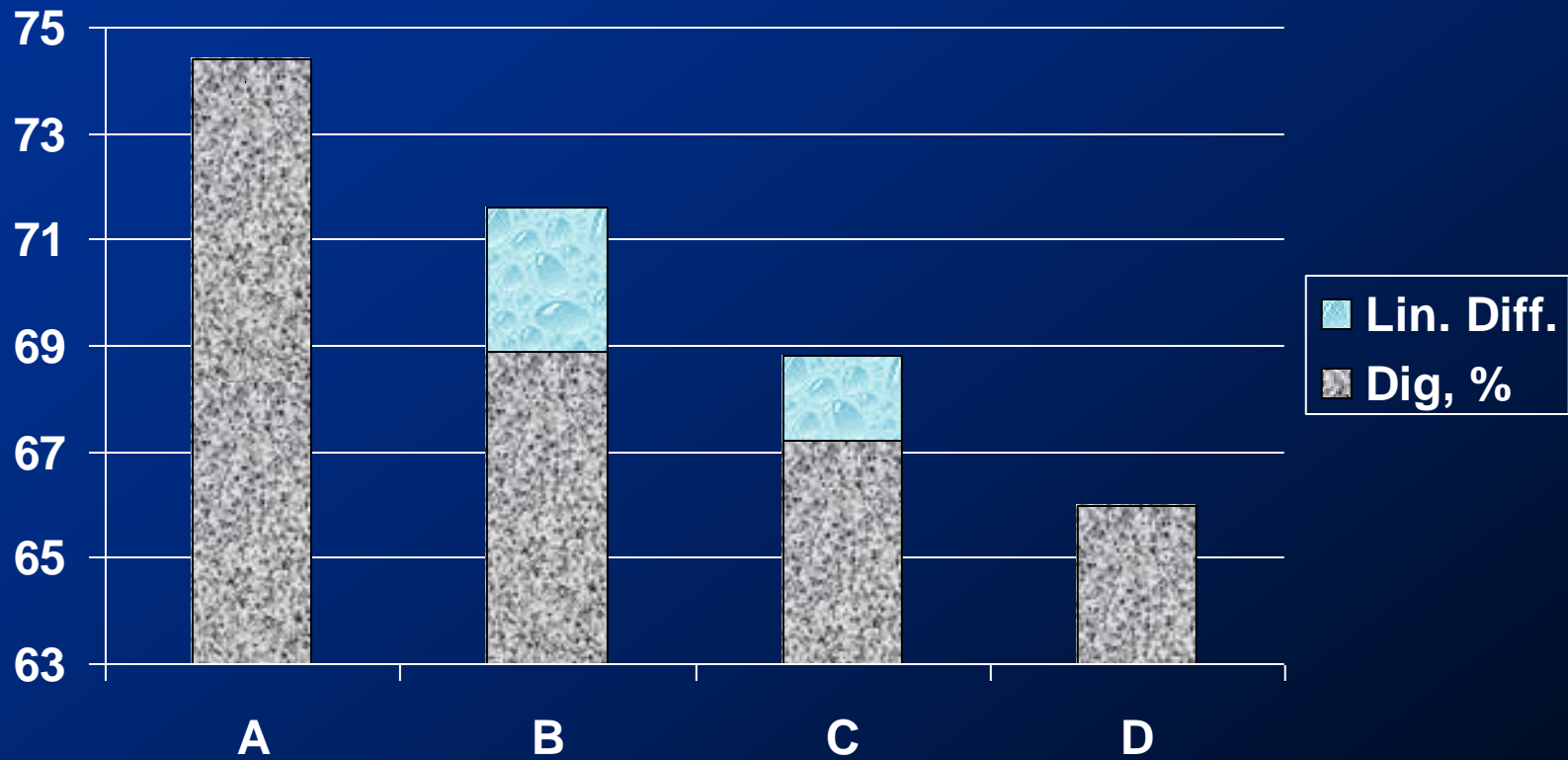
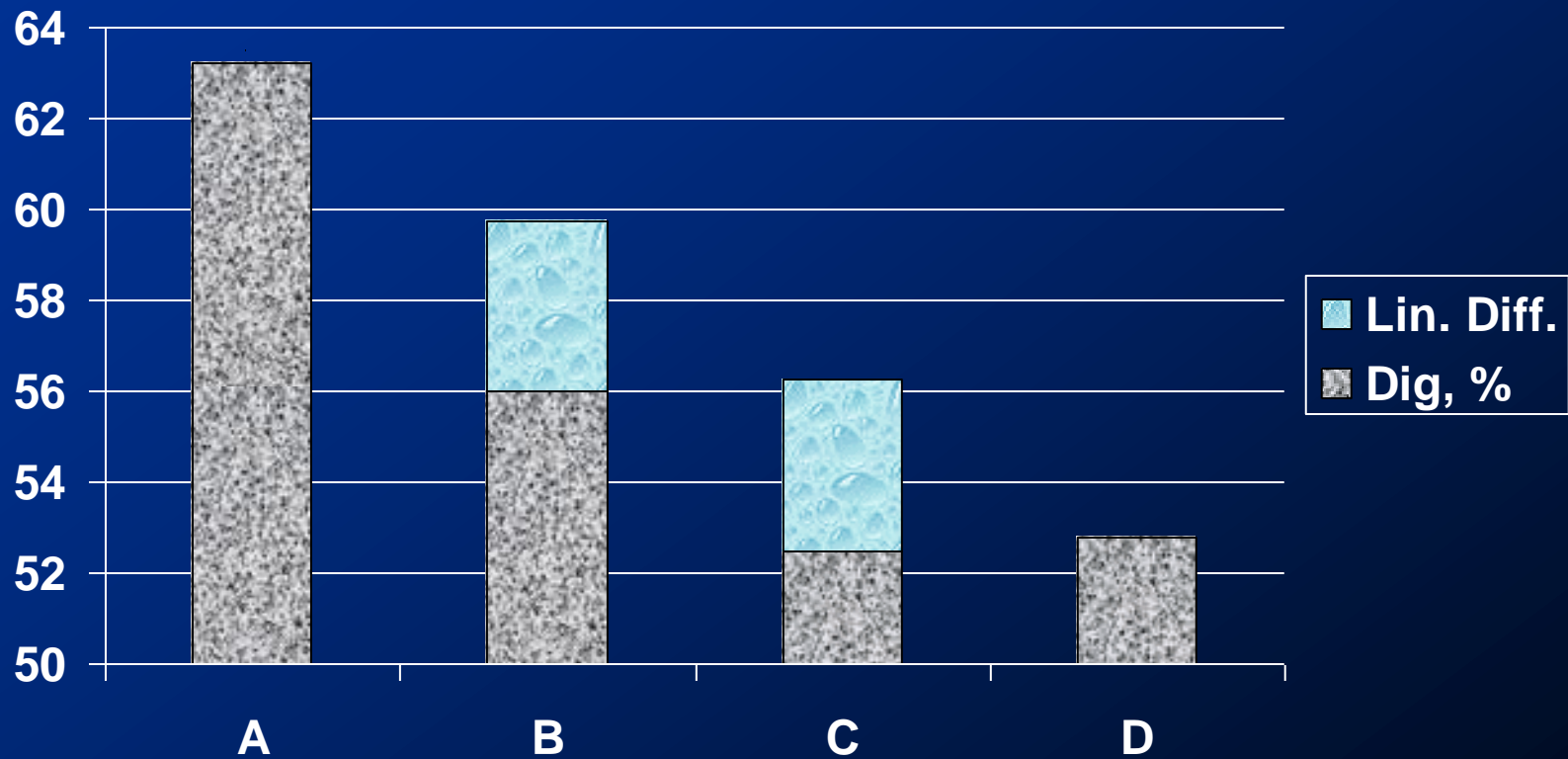


Figure 21.3. Relation between intake of dry matter (DM) and the digestible energy (DE) in the feed ingested. Data fitting this model are obtained when a concentrate diet is diluted with a bulky filler or coarse forage (Conrad, 1966; Baumgardt, 1970).

DM Digestibility



NDF Digestibility



Do High-Forage Diets Work?



World Record Cow Ever-Green-View My 1326 ET
72,170# milk, 2,787# fat, 2,142# protein

Ration was 69% forage

Photo from Agri-View 3/18/10

THANK YOU