Understanding Hay

TRIBUTE®
SUPERIOR EQUINE NUTRITION

What is hay?

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SUPERIOR EQUINE NUTRITION

What is hay?

- Dried preserved forage
- Typically between 85 - 90+% Dry Matter
- Typically baled (small squares, large squares, round bales, etc.)
- Used to feed animals

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Why is hay important?

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Why is hay important?

- Portable
- Readily available when fresh forage is not
- We can regulate intake
- Can be used to supplement
- Expensive
- Quality is variable

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What is our tool to measure hay quality?

HAY ANALYSIS!!

- Moisture (DM)
- Crude Protein (CP)
- Fiber:
  - NDF (energy and intake)
  - ADF (digestibility)
- Non-Structural Carbohydrates (NSC)
- Macro & Micro Minerals

	High Quality	Moderate Quality	Low Quality
NDF	40-50%	50-60%	> 60%
ADF	30-35%	35-40%	> 40%

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Percent is not a unit of intake…

75% NSC

75% NSC

Starch + sugar (%) x intake = NSC intake

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Types Of Forages Used For Hay

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Warm Season Grasses

Bahia Grass

Bermudagrass

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Warm Season Grass Characteristics

- Grows during warm periods of year, late spring-early fall
- Grown predominately in southern climates
- Rapid growth, large quantity
- Typically moderate to low CP levels
- Moderate digestibility
- Moderate energy

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Cool Season Grasses

Orchardgrass

Timothy

Fescue

Cool Season Grass Characteristics

- Grows during cooler times of the year, spring and fall
- Grown predominately in northern climates
- Moderate quantity
- Moderate to high CP
- Moderate to high digestibility

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Legumes

Alfalfa

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Legume Characteristics

- Grows during cooler times of the year, spring and fall
- Grows well in dryer, cool climates such as out west
- High CP
- High digestibility
- Buffering capability

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What Do Forage Analyses Look Like?

What Do They Tell Us?

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Bermudagrass

- Relative Forage Quality (RFQ) : **141.33**

Near Infrared Reflectance Analysis

Lab ID : 19.F0219

	Dry Matter (%)	As-fed (%)
Moisture	0.00	10.87
Dry Matter (DM)	100.00	89.13
Crude Protein (CP)	16.19	14.43
Acid Detergent Fiber (ADF)	34.08	30.38
Neutral Detergent Fiber (NDF)	72.37	64.50
Total Digestible Nutrients (TDN)	62.62	55.81

* stands for values calculated from current research formula, % stands for parts per 100 of the material, ppm stands for parts per million.

Comments :

Date : 02/13/2019

Coastal Bermudagrass

SAMPLE INFORMATION			
Lab ID:	33504 044	Series:	
Crop Year:	2022	Version:	2.0
Cutting#:			
Feed Type:	GRASS FORAGE		

CHEMISTRY ANALYSIS RESULTS	
Moisture	10.0
Dry Matter	90.0

PROTEINS	% SP	% CP	% DM
Crude Protein			8.1
Adjusted Protein			8.1
Soluble Protein		31.6	2.6
Ammonia (CPE)			
ADF Protein (ADICP)		11.1	0.90
NDF Protein (NDICP)		30.0	2.43
NDR Protein (NDRCP)			
Rumen Degr. Protein		65.8	5.3

FIBER	% NDF	% DM
ADF	46.1	30.6
aNDF		66.5
aNDFom		
NDR (NDF w/o sulfite)		
Crude Fiber		
Lignin	7.95	5.29
NDF Digestibility (12 hr)		
NDF Digestibility (24 hr)		
NDF Digestibility (30 hr)		
NDF Digestibility (72 hr)		
NDF Digestibility (240 hr)		
uNDF (30 hr)		
uNDF (240 hr)		

MINERALS	
Ash (%DM)	7.19
Calcium (%DM)	0.34
Phosphorus (%DM)	0.16
Magnesium (%DM)	0.19
Potassium (%DM)	1.44
Sulfur (%DM)	0.32
Sodium (%DM)	0.11
Chloride (%DM)	0.67
Iron (PPM)	138
Manganese (PPM)	67
Zinc (PPM)	30
Copper (PPM)	9
Molybdenum (PPM)	

FERMENTATION
pH
Total VFA
Lactic Acid (%DM)
Lactic as % of Total VFA
Acetic Acid (%DM)
Propionic Acid (%DM)
Butyric Acid (%DM)
Isobutyric Acid (%DM)
1, 2 Propanediol (%DM)
Nitrate Ion (%DM)
Nitrate-Nitrogen, ppm

ENERGY & INDEX CALCULATIONS	
TDN (%DM)	55.0
Net Energy Lactation (Mcal/lb)	0.56
Net Energy Lactation NASEM (Mcal/lb)	
Net Energy Maintenance (Mcal/lb)	0.52
Net Energy Gain (Mcal/lb)	0.27
ME (Mcal/lb)	0.91

Coastal Bermudagrass

SAMPLE INFORMATION			
Lab ID:	33504 044	Series:	
Crop Year:	2022	Version:	2.0
Cutting#:			
Feed Type:	GRASS FORAGE		

CHEMISTRY ANALYSIS RESULTS	
Moisture	10.0
Dry Matter	90.0

PROTEINS	% SP	% CP	% DM
Crude Protein			8.1
Adjusted Protein			8.1
Soluble Protein		31.6	2.6
Ammonia (CPE)			
ADF Protein (ADICP)		11.1	0.90
NDF Protein (NDICP)		30.0	2.43
NDR Protein (NDRCP)			
Rumen Degr. Protein		65.8	5.3

FIBER	% NDF	% DM
ADF		30.6
aNDF		66.5
aNDFom		
NDR (NDF w/o sulfite)		
Crude Fiber		
Lignin	7.95	5.29
NDF Digestibility (12 hr)		
NDF Digestibility (24 hr)		
NDF Digestibility (30 hr)		
NDF Digestibility (72 hr)		
NDF Digestibility (240 hr)		
uNDF (30 hr)		
uNDF (240 hr)		

MINERALS	
Ash (%DM)	7.19
Calcium (%DM)	0.34
Phosphorus (%DM)	0.16
Magnesium (%DM)	0.19
Potassium (%DM)	1.44
Sulfur (%DM)	0.32
Sodium (%DM)	0.11
Chloride (%DM)	0.67
Iron (PPM)	138
Manganese (PPM)	67
Zinc (PPM)	30
Copper (PPM)	9
Molybdenum (PPM)	

FERMENTATION	
pH	
Total VFA	
Lactic Acid (%DM)	
Lactic as % of Total VFA	
Acetic Acid (%DM)	
Propionic Acid (%DM)	
Butyric Acid (%DM)	
Isobutyric Acid (%DM)	
1, 2 Propanediol (%DM)	
Nitrate Ion (%DM)	
Nitrate-Nitrogen, ppm	

ENERGY & INDEX CALCULATIONS	
TDN (%DM)	55.0
Net Energy Lactation (Mcal/lb)	0.56
Net Energy Lactation NASEM (Mcal/lb)	
Net Energy Maintenance (Mcal/lb)	0.52
Net Energy Gain (Mcal/lb)	0.27

Alfalfa Mix

% Moisture	10.2			
% Dry Matter	89.8			
		As Sampled		Dry Matter
Digestible Energy (DE), Mcal/lb		1.04		1.16
	%	g/lb.	%	g/lb.
Crude Protein	16.2	73.5	18.0	81.8
Estimated Lysine	.76	3.4	.85	3.8
Acid Detergent Fiber (ADF)	22.9	103.7	25.5	115.5
Neutral Detergent Fiber (aNDF)	36.0	163.5	40.1	182.1
WSC (Water Sol. Carbs.)	13.8	62.5	15.4	69.6
ESC (Simple Sugars)	9.6	43.4	10.7	48.3
Starch	1.5	7.0	1.7	7.8
Non Fiber Carb. (NFC)	27.8	125.9	30.9	140.3
	%	g/lb.	%	g/lb.
Calcium	.95	4.32	1.06	4.81
Phosphorus	.24	1.10	.27	1.22
	As Fed		100% Dry	
RFV			160	

Alfalfa Mix

% Moisture	10.2			
% Dry Matter	89.8			
		As Sampled		Dry Matter
Digestible Energy (DE), Mcal/lb		1.04		1.16
	%	g/lb.	%	g/lb.
Crude Protein	16.2	73.5	18.0	81.8
Estimated Lysine	.76	3.4	.85	3.8
Acid Detergent Fiber (ADF)	22.9	103.7	25.5	115.5
Neutral Detergent Fiber (aNDF)	36.0	163.5	40.1	182.1
WSC (Water Sol. Carbs.)	13.8	62.5	15.4	69.6
ESC (Simple Sugars)	9.6	43.4	10.7	48.3
Starch	1.5	7.0	1.7	7.8
Non Fiber Carb. (NFC)	27.8	125.9	30.9	140.3
	%	g/lb.	%	g/lb.
Calcium	.95	4.32	1.06	4.81
Phosphorus	.24	1.10	.27	1.22
	As Fed		100% Dry	
RFV			160	

Grass Hay

SAMPLE INFORMATION			
Lab ID:	30496 050	Version:	1.0
Crop Year:	2021	Series:	
Feed Type:	GRASS FORAGE	Cutting #:	
Package:	NIR Wet Minerals		

NIR ANALYSIS RESULTS	
Moisture	13.0
Dry Matter	87.0

PROTEINS	% SP	% CP	% DM
Crude Protein			14.3
Adjusted Protein			14.3
Soluble Protein		25.4	3.6
Ammonia (CPE)	7.2	1.8	0.26
ADF Protein (ADICP)		10.7	1.52
NDF Protein (NDICP)		39.4	5.62
NDR Protein (NDRCP)			
Rumen Degr. Protein		62.7	8.9
Amino Acid Protein, Total			

FIBER	%NDFom	NDFom %DM	% NDF	% DM
ADF			59.4	38.0
aNDF		62.4		64.0
NDR (NDF w/o sulfite)				
Crude Fiber				
Lignin			7.01	4.49
NDF Digestibility (12 hr)				
NDF Digestibility (24 hr)				
NDF Digestibility (30 hr)	57.2	35.7	56.3	36.0
NDF Digestibility (72 hr)				
NDF Digestibility (120 hr)	65.8	41.1	64.7	41.4
NDF Digestibility (240 hr)	69.4	43.3	68.1	43.6
uNDF (12 hr)				
uNDF (30 hr)	42.8	26.7	43.7	28.0
uNDF (120 hr)	34.2	21.3	35.4	22.6
uNDF (240 hr)	30.6	19.1	31.9	20.4

CARBOHYDRATES	% Starch	% NFC	% DM
Silage Acids			
Ethanol Soluble CHO (ESC-Sugar)		33.4	5.4
Water Soluble CHO (WSC-Sugar)			7.9
Starch		13.9	2.3
Soluble Starch			
Soluble Fiber			
Starch Dig. (7 hr, 4 mm)			
Crude Fat			3.33
Fatty Acids, Total			1.31
C16:0			0.28
C18:0			0.02
C18:1			0.05
C18:2			0.24
C18:3			0.47

MINERALS	
Ash (%DM)	7.85
Calcium (%DM)	**0.33**
Phosphorus (%DM)	**0.36**
Magnesium (%DM)	**0.24**
Potassium (%DM)	**2.96**
Sulfur (%DM)	0.27
Sodium (%DM)	**0.03**
Chloride (%DM)	
Iron (PPM)	**116**
Manganese (PPM)	**86**
Zinc (PPM)	**27**
Copper (PPM)	**9**
Molybdenum (PPM)	

QUALITATIVE	
pH	
Total VFA (%DM)	
Lactic Acid (%DM)	
Lactic as % of Total VFA	
Acetic Acid (%DM)	
Butyric Acid (%DM)	
1, 2 Propanediol (%DM)	
Nitrate Ion (%DM)	
Nitrate-Nitrogen, ppm	

Soil Contamination Probability	Probable low to none
NIR Statistical Confidence	Excellent prediction potential

ENERGY & INDEX CALCULATIONS	
TDN (%DM)	59.8
Net Energy Lactation (Mcal/lb)	0.61
Net Energy Maintenance (Mcal/lb)	0.61
Net Energy Gain (Mcal/lb)	0.35
ME (Mcal/lb)	1
AA Protein as % of Total Protein	
NDF Dig. Rate (Kd, %HR, Van Amburgh, Lignin*2.4)	3.55
NDF Dig. Rate (Kd, %HR, uNDF)	4.8
Starch Dig. Rate (Kd, %HR, Mertens)	
Relative Feed Value (RFV)	86
Relative Forage Quality (RFQ)	120
Milk per Ton (lbs/ton)	2763
Dig. Organic Matter Index (lbs/ton)	1139
Non Fiber Carbohydrates (%DM)	16.2
Non Structural Carbohydrates, ESC (%DM)	7.7
Non Structural Carbohydrates, WSC (%DM)	10.2
DCAD (meq/100gdm)	
Summative Index % (Mass Balance)	

Additional sample information, submitted documents and lab pictures linked to QR code

Grass Hay

SAMPLE INFORMATION			
Lab ID:	30496 050	Version:	1.0
Crop Year:	2021	Series:	
Feed Type:	GRASS FORAGE	Cutting#:	
Package:	NIR Wet Minerals		

NIR ANALYSIS RESULTS	
Moisture	13.0
Dry Matter	87.0

PROTEINS	% SP	% CP	% DM
Crude Protein			14.3
Adjusted Protein			14.3
Soluble Protein		25.4	3.6
Ammonia (CPE)	7.2	1.8	0.26
ADF Protein (ADICP)		10.7	1.52
NDF Protein (NDICP)		39.4	5.62
NDR Protein (NDRCP)			
Rumen Degr. Protein		62.7	8.9
Amino Acid Protein, Total			

FIBER	%NDFom	NDFom %DM	% NDF	% DM
ADF			59.4	38.0
aNDF		62.4		64.0
NDR (NDF w/o sulfite)				
Crude Fiber				
Lignin			7.01	4.49
NDF Digestibility (12 hr)				
NDF Digestibility (24 hr)				
NDF Digestibility (30 hr)	57.2	35.7	56.3	36.0
NDF Digestibility (72 hr)				
NDF Digestibility (120 hr)	65.8	41.1	64.7	41.4
NDF Digestibility (240 hr)	69.4	43.3	68.1	43.6
uNDF (12 hr)				
uNDF (30 hr)	42.8	26.7	43.7	28.0
uNDF (120 hr)	34.2	21.3	35.4	22.6
uNDF (240 hr)	30.6	19.1	31.9	20.4

MINERALS	
Ash (%DM)	7.85
Calcium (%DM)	**0.33**
Phosphorus (%DM)	**0.36**
Potassium (%DM)	**2.96**
Sulfur (%DM)	0.27
Sodium (%DM)	**0.03**
Chloride (%DM)	
Iron (PPM)	**116**
Manganese (PPM)	**86**
Zinc (PPM)	**27**
Copper (PPM)	**9**
Molybdenum (PPM)	

QUALITATIVE
pH
Total VFA (%DM)
Lactic Acid (%DM)
Lactic as % of Total VFA
Acetic Acid (%DM)
Butyric Acid (%DM)
1, 2 Propanediol (%DM)
Nitrate Ion (%DM)
Nitrate-Nitrogen, ppm

Soil Contamination Probability	Probable low to none
NIR Statistical Confidence	Excellent prediction potential

ENERGY & INDEX CALCULATIONS	
TDN (%DM)	59.8
Net Energy Lactation (Mcal/lb)	0.61
Net Energy Maintenance (Mcal/lb)	0.61
Net Energy Gain (Mcal/lb)	0.35
ME (Mcal/lb)	1
AA Protein as % of Total Protein	
NDF Dig. Rate (Kd, %HR, Van Amburgh, Lignin*2.4)	3.55

Fescue Mix

		Typical Range for Forage Type(DM BASIS)			RESULTS FOR YOUR HAY	
Method	PARAMETER	UNITS	LOW	HIGH	DM BASIS	As Is
C	Moisture	%	8.0	13.0	0.00	9.96
W	Dry Matter	%	87.00	92.00	100.00	90.04
N	Crude Protein	%	7.0	14.0	7.95	7.16
N	Heat Damaged Protein (ADICP)	%	0.70	1.40	1.18	1.06
C	Available Protein	%	6.30	12.60	6.77	6.10
C	Est. Lysine	%	0.24	0.48	0.39	0.35
N	Fat	%	2.0	2.4	1.07	0.97
N	Ash	%	7.0	8.6	6.48	5.83
N	ADF	%	31.0	41.0	41.14	37.05
N	NDF	%	50.0	65.0	69.78	62.83
C	RFV (Industry)		87.0	103.0	75.79	68.24
	RFV GRADE		See Page 2		4	
N	Calcium	%	0.3	0.8	0.26	0.24
N	Phosphorus	%	0.20	0.30	0.22	0.20
C	Ca/P Ratio		1:1	2.5:1	1.18	1.18
N	Potassium	%	0.80	1.50	2.44	2.20
N	Magnesium	%	0.2	0.3	0.15	0.14
N	Sodium	%	0.07	0.19	0.05	0.05
N	Chloride	%	0.1	0.8	0.50	0.45
N	Sulfur	%	0.15	0.30	0.16	0.15
C	*Est. Copper	ppm	2.00	10.00	6.00	5.40
C	*Est. Zinc	ppm	12.0	26.0	19.00	17.11
N	Starch	%			1.15	1.03
N	WSC + Starch	%	*** See Below		8.84	7.96
N	ESC + Starch	%	*** See Below		4.67	4.21
C	DE (Horse)**	Mcal/kg	1.80	2.09	1.90	1.71
C	DE (Horse)**	kcal/lb	820.0	950.0	863.64	777.27

Fescue Mix

Method	PARAMETER	UNITS	Typical Range for Forage Type(DM BASIS) LOW		HIGH	RESULTS FOR YOUR HAY DM BASIS	As Is
C	Moisture	%	8.0	-	13.0	0.00	9.96
W	Dry Matter	%	87.00	-	92.00	100.00	90.04
N	Crude Protein	%	7.0	-	14.0	7.95	7.16
N	Heat Damaged Protein (ADICP)	%	0.70	-	1.40	1.18	1.06
C	Available Protein	%	6.30		12.60	6.77	6.10
C	Est. Lysine	%	0.24	-	0.48	0.39	0.35
N	Fat	%	2.0	-	2.4	1.07	0.97
N	Ash	%	7.0	-	8.6	6.48	5.83
N	ADF	%	31.0	-	41.0	41.14	37.05
N	NDF	%	50.0	-	65.0	69.78	62.83
C	RFV (Industry)		87.0	-	103.0	75.79	68.24
	RFV GRADE		See Page 2			4	
N	Calcium	%	0.3	-	0.8	0.26	0.24
N	Phosphorus	%	0.20	-	0.30	0.22	0.20
C	Ca/P Ratio		1:1	-	2.5:1	1.18	1.18
N	Potassium	%	0.80	-	1.50	2.44	2.20
N	Magnesium	%	0.2	-	0.3	0.15	0.14
N	Sodium	%	0.07	-	0.19	0.05	0.05
N	Chloride	%	0.1	-	0.8	0.50	0.45
N	Sulfur	%	0.15	-	0.30	0.16	0.15
C	*Est. Copper	ppm	2.00	-	10.00	6.00	5.40
C	*Est. Zinc	ppm	12.0	-	26.0	19.00	17.11
N	Starch	%				1.15	1.03
N	WSC + Starch	%	*** See Below			8.84	7.96
N	ESC + Starch	%	*** See Below			4.67	4.21
C	DE (Horse)**	Mcal/kg	1.80	-	2.09	1.90	1.71
C	DE (Horse)**	kcal/lb	820.0	-	950.0	863.64	777.27

Alfalfa

Method	PARAMETER	UNITS	Typical Range for Forage Type(DM BASIS) LOW	HIGH	RESULTS FOR YOUR HAY DM BASIS	As Is
C	Moisture	%	8.0	13.0	0.00	8.76
W	Dry Matter	%	87.00	92.00	100.00	91.24
N	Crude Protein	%	16.0	23.0	16.78	15.31
N	Heat Damaged Protein (ADICP)	%	1.60	2.30	0.66	0.60
C	Available Protein	%	14.40	20.70	16.13	14.71
C	Est. Lysine	%	0.80	1.15	0.81	0.74
N	Fat	%	2.6	3.0	1.87	1.71
N	Ash	%	7.8	9.2	8.66	7.90
N	ADF	%	27.0	36.0	33.83	30.86
N	NDF	%	36.0	50.0	42.64	38.90
C	RFV (Industry)		87.0	103.0	136.46	124.50
	RFV GRADE		See Page 2		1	
N	Calcium	%	1.2	1.8	1.82	1.66
N	Phosphorus	%	0.25	0.35	0.24	0.22
C	Ca/P Ratio		4:1	6:1	7.70	7.70
N	Potassium	%	2.00	3.50	1.43	1.30
N	Magnesium	%	0.2	0.4	0.40	0.37
N	Sodium	%	0.08	0.12	0.12	0.11
N	Chloride	%	0.3	1.0	0.40	0.37
N	Sulfur	%	0.25	0.35	0.26	0.23
C	*Est. Copper	ppm	4.00	10.00	7.00	6.39
C	*Est. Zinc	ppm	14.0	28.0	20.00	18.25
N	Starch	%			1.46	1.33
N	WSC + Starch	%	*** See Below		12.70	11.58
N	ESC + Starch	%	*** See Below		9.09	8.29
C	DE (Horse)**	Mcal/kg	2.22	2.57	2.44	2.23
C	DE (Horse)**	kcal/lb	1010.0	1170.0	1110.91	1013.18

* Indicates nutrient is an outlier and will be re-run by wet chemistry

Alfalfa

Method	PARAMETER	UNITS	Typical Range for Forage Type(DM BASIS) LOW	HIGH	RESULTS FOR YOUR HAY DM BASIS	As Is
C	Moisture	%	8.0	13.0	0.00	8.76
W	Dry Matter	%	[illegible]	[illegible]	100.00	91.24
N	Crude Protein	%	16.0	23.0	16.78	15.31
N	Heat Damaged Protein (ADICP)	%	1.60	2.30	0.66	0.60
C	Available Protein	%	14.40	20.70	16.13	14.71
C	Est. Lysine	%	0.80	1.15	0.81	0.74
N	Fat	%	2.6	3.0	1.87	1.71
N	Ash	%	7.8	9.2	8.66	7.90
N	ADF	%	27.0	36.0	33.83	30.86
N	NDF	%	36.0	50.0	42.64	38.90
C	RFV (Industry)		87.0	103.0	136.46	124.50
	RFV GRADE		See Page 2		1	
N	Calcium	%	1.2	1.8	1.82	1.66
N	Phosphorus	%	0.25	0.35	0.24	0.22
C	Ca/P Ratio		4:1	6:1	7.70	7.70
N	Potassium	%	2.00	3.50	1.43	1.30
N	Magnesium	%	0.2	0.4	0.40	0.37
N	Sodium	%	0.08	0.12	0.12	0.11
N	Chloride	%	0.3	1.0	0.40	0.37
N	Sulfur	%	0.25	0.35	0.26	0.23
C	*Est. Copper	ppm	4.00	10.00	7.00	6.39
C	*Est. Zinc	ppm	14.0	28.0	20.00	18.25
N	Starch	%			1.46	1.33
N	WSC + Starch	%	*** See Below		12.70	11.58
N	ESC + Starch	%	*** See Below		9.09	8.29
C	DE (Horse)**	Mcal/kg	2.22	2.57	2.44	2.23
C	DE (Horse)**	kcal/lb	1010.0	1170.0	1110.91	1013.18

* Indicates nutrient is an outlier and will be re-run by wet chemistry

Orchard Alfalfa Mix

Hay - Mixed

Method	PARAMETER	UNITS	Typical Range for Forage Type(DM BASIS) LOW		HIGH	RESULTS FOR YOUR HAY DM BASIS	As Is
C	Moisture	%	8.0	-	13.0	0.00	9.71
W	Dry Matter	%	87.00	-	92.00	100.00	90.29
N	Crude Protein	%	10.0	-	17.0	14.60	13.18
N	Heat Damaged Protein (ADICP)	%	1.00	-	1.70	0.84	0.75
C	Available Protein	%	14.40		15.30	13.77	12.43
C	Est. Lysine	%	0.51	-	0.76	0.71	0.64
N	Fat	%	2.3	-	2.7	2.22	2.01
N	Ash	%	7.4	-	8.9	10.04	9.06
N	ADF	%	31.0	-	40.0	35.29	31.86
N	NDF	%	46.0	-	62.0	54.62	49.31
C	RFV (Industry)		87.0	-	103.0	104.60	94.44
	RFV GRADE		See Page 2			2	
N	Calcium	%	0.8	-	1.2	0.97	0.87
N	Phosphorus	%	0.25	-	0.35	0.24	0.22
C	Ca/P Ratio		2:1	-	4:1	3.96	3.96
N	Potassium	%	1.50	-	3.00	2.55	2.30
N	Magnesium	%	0.2	-	0.3	0.30	0.27
N	Sodium	%	0.08	-	0.16	0.02	0.02
N	Chloride	%	0.0	-	0.7	0.83	0.75
N	Sulfur	%	0.20	-	0.35	0.21	0.19
C	*Est. Copper	ppm	4.00	-	10.00	7.00	6.32
C	*Est. Zinc	ppm	14.0	-	26.0	20.00	18.06
N	Starch	%				1.62	1.46
N	WSC + Starch	%	*** See Below			9.16	8.27
N	ESC + Starch	%	*** See Below			6.96	6.28
C	DE (Horse)**	Mcal/kg	1.98	-	2.31	2.11	1.90
C	DE (Horse)**	kcal/lb	900.0	-	1050.0	958.64	865.45

* *Indicates nutrient is an outlier and will be re-run by wet chemistry*

Orchard Alfalfa Mix

Hay - Mixed

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* *Indicates nutrient is an outlier and will be re-run by wet chemistry*

Table 1: Typical nutrient content of hays fed to horses (as-fed basis)*					
Hay Variety	**Digestible Energy (Mcal/lb)**	**Acid Detergent Fiber (%)**	**Crude Protein (%)**	**Calcium (%)**	**Phosphorus (%)**
Alfalfa	0.8 to 1.1	24 to 34	15 to 22	0.9 to 1.5	0.2 to 0.3
Perennial peanut	0.8 to 1.0	28 to 38	10 to 15	0.9 to 1.5	0.2 to 0.3
Orchardgrass	0.7 to 1.0	30 to 40	7 to 11	0.3 to 0.5	0.2 to 0.3
Timothy	0.6 to 1.0	30 to 40	6 to 11	0.3 to 0.5	0.2 to 0.3
Bermudagrass	0.7 to 1.0	28 to 38	6 to 11	0.3 to 0.5	0.15 to 0.3
Grass/legume mix hay	0.8 to 1.0	27 to 36	12 to 18	0.8 to 1.2	0.2 to 0.3

**Source: Dairy One, Feed Composition Laboratory*

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Hyper focus on one area to the detriment of the total diet

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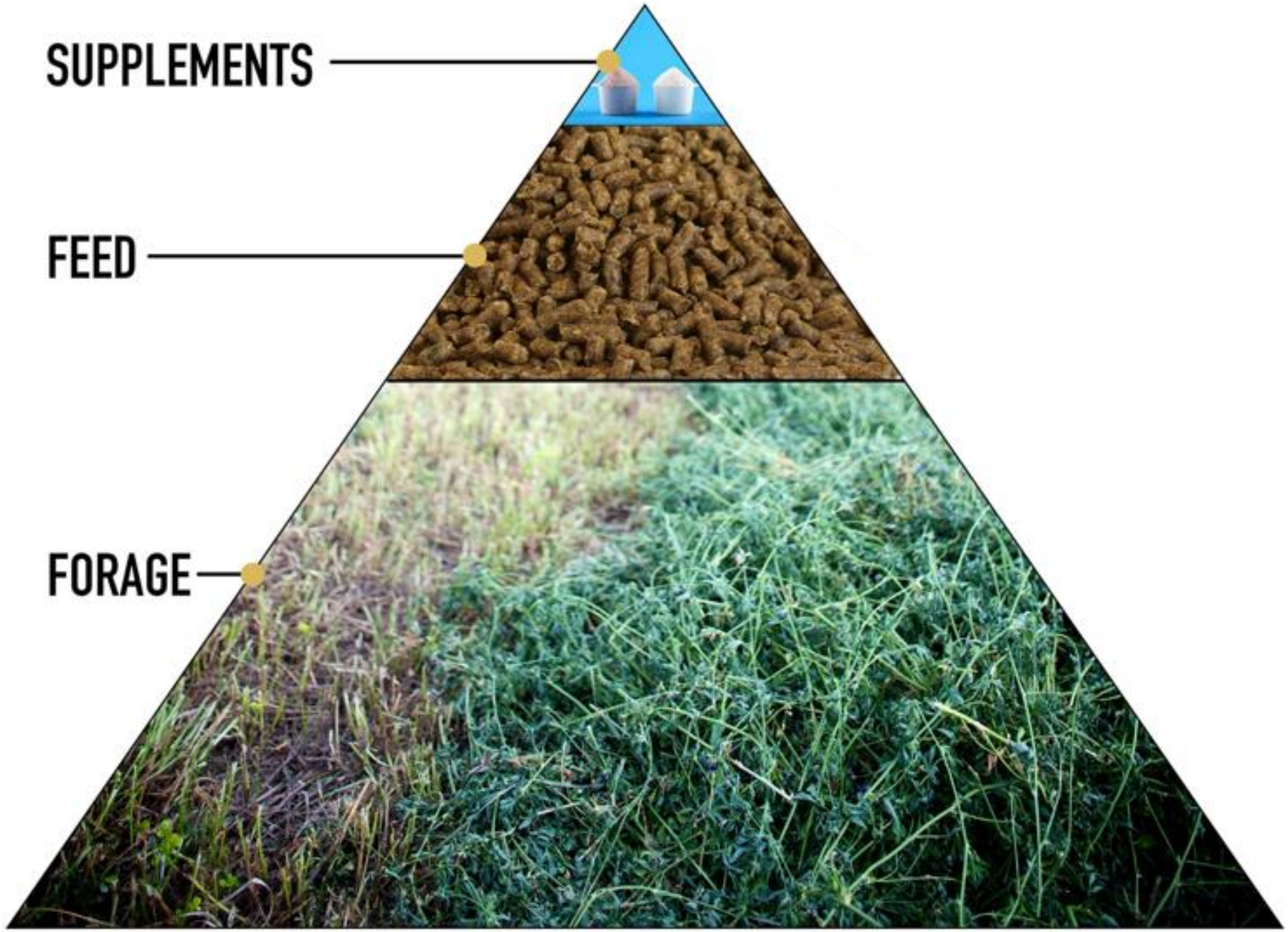
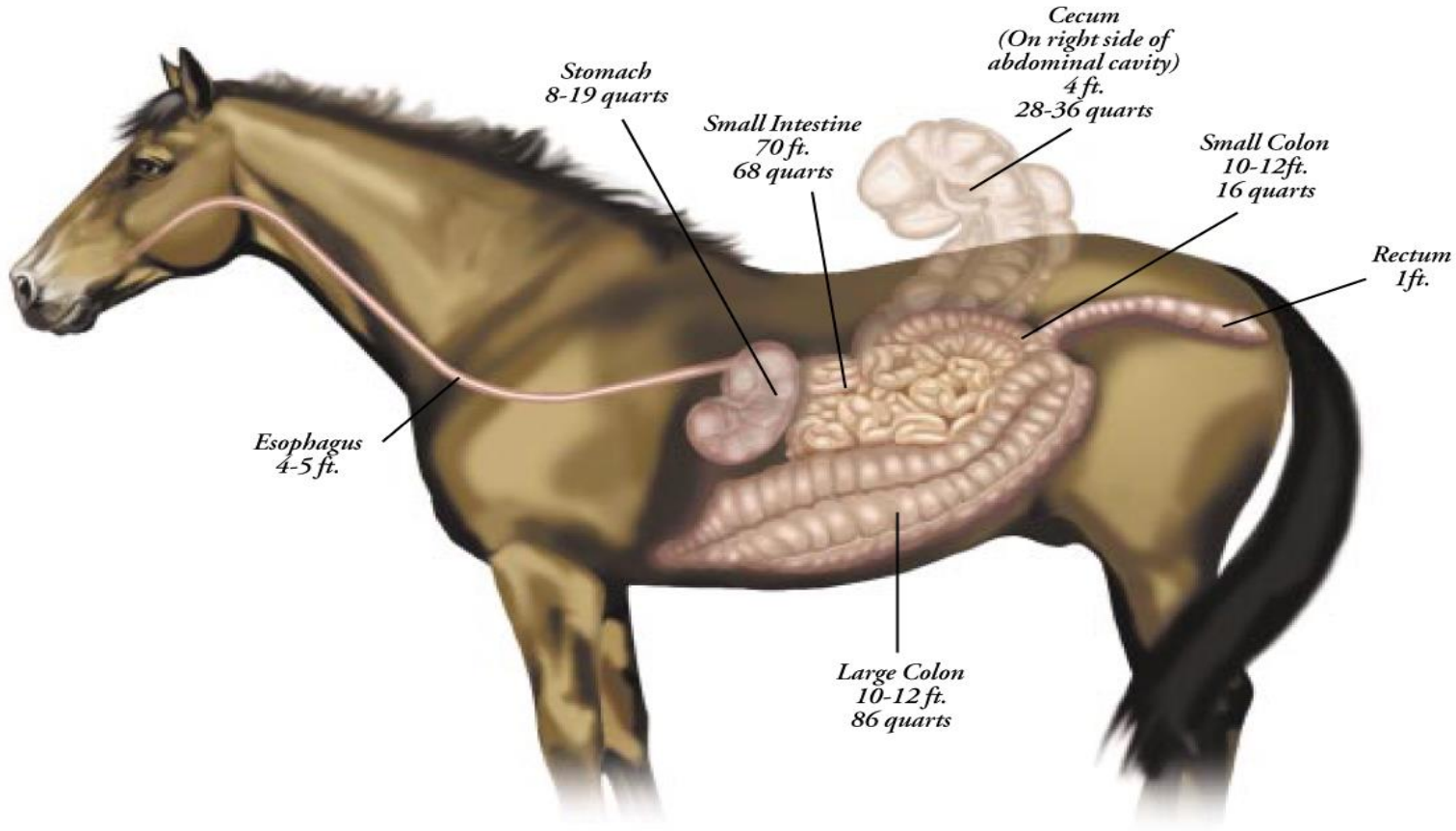

SUPPLEMENTS
FEED
FORAGE

Ideal 2%+ forage on a BW basis



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Minimum amount of forage?

Overweight

1.0% Body Weight, DM

Everybody else

1.5% + Body Weight, DM

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It is the hay the horse eats that actually counts…

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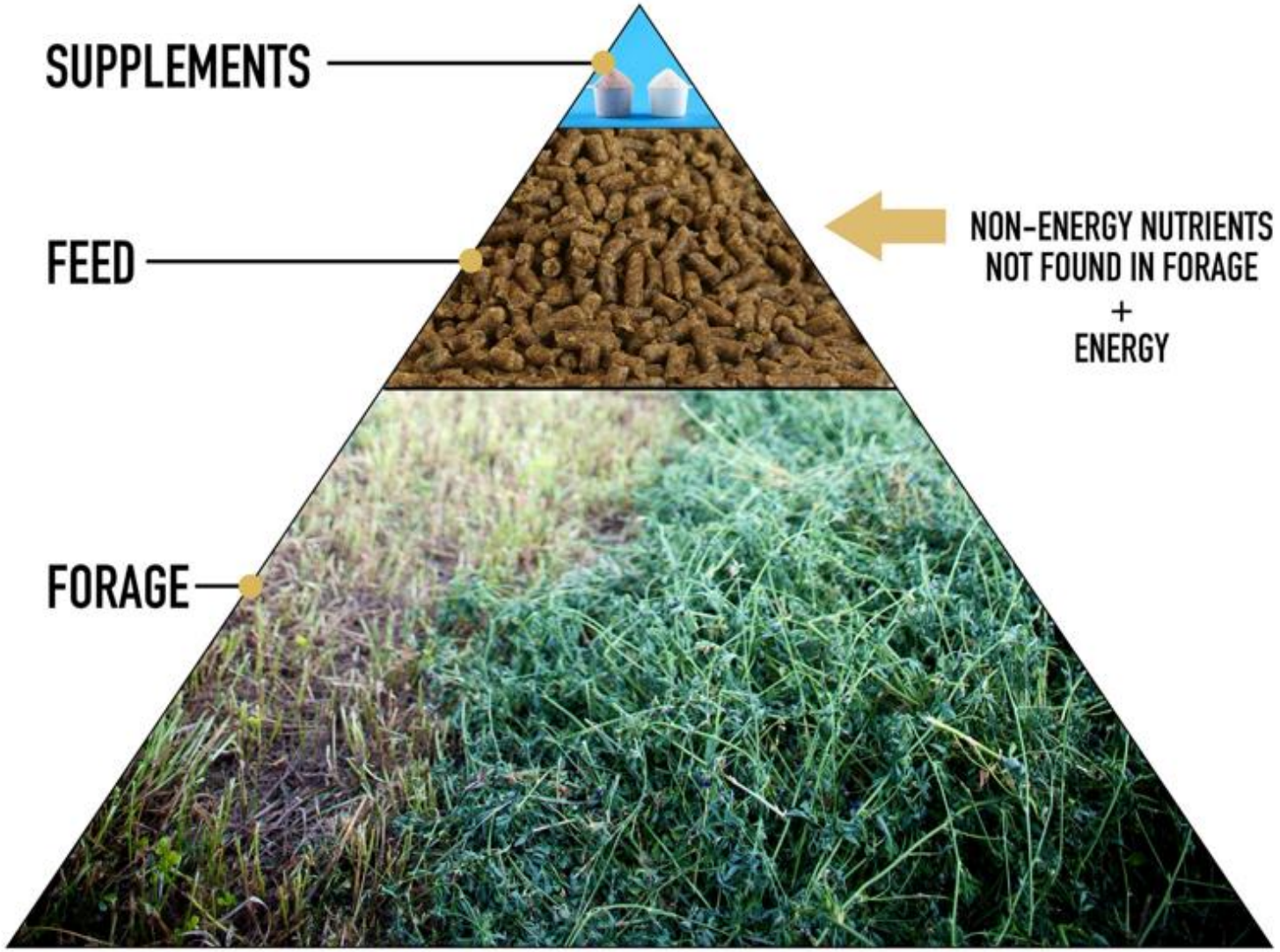
Choosing the correct hay

Table 3: Guidelines for Matching Hay to the Horse

Horse	Type of Hay	Visual Characteristics*	Laboratory Characteristics	
			Crude Protein	ADF
Weanlings Lactating mares	Early- to Mid- Maturity Legume hays or Grass/legume Mix hays	Leafy Fine stemmed Few seed heads/flowers	> 14%	< 34%
Performance Yearlings 2-year-olds	Mid- Maturity Grass or Legume hays or Grass/legume Mix hays	Leafy Medium-fine stems Small, soft seed heads, small flowers on legumes	12 – 16 %	30 – 36%
Recreation use or idle horses	Mid- to Late-Maturity Grass hays Late- Maturity Grass/legume Mix	Medium stems Large, soft seed heads, flowers on legumes	8 – 12%	37 – 40 %
Overweight	Late- Maturity Grass hays	Thick, coarse stems Large, brittle seed heads	7 – 10%	> 40%

**All hay should be clean-smelling and free from molds, weeds and trash; avoid excessive rain damaged hay.*

What is hay not?



- Forage diets
  - Deficient
    - Amino acids
    - Copper and Zinc
    - Vitamins

Non-Energy Nutrients

Nutrient	Functions
AMINO ACIDS/ PROTEIN	1. Body structure – GROWTH 2. Connective tissue (ligaments, tendons, keratin etc.) 3. Tissue repair/replacement 4. Blood proteins 5. Hormones 6. Antibodies (immune system) 7. Heredity (DNA, RNA) 8. Energy supply (after requirement met)
MINERALS	1. Skeletal formation and maintenance 2. Enzyme cofactors 3. Oxygen transport (hemoglobin, myoglobin) 4. Nerve impulse conduction 5. Storage in bones, liver and kidneys
VITAMINS	1. Energy metabolism 2. Enzyme cofactors 3. Vitamin/Mineral relationships

So, how do I feed my horse?

With a Targeted Nutrition Approach

- Forage First
- Feed to Fill Forage Gaps
  - Full Concentrate
  - Diet Balancer
- Supplements

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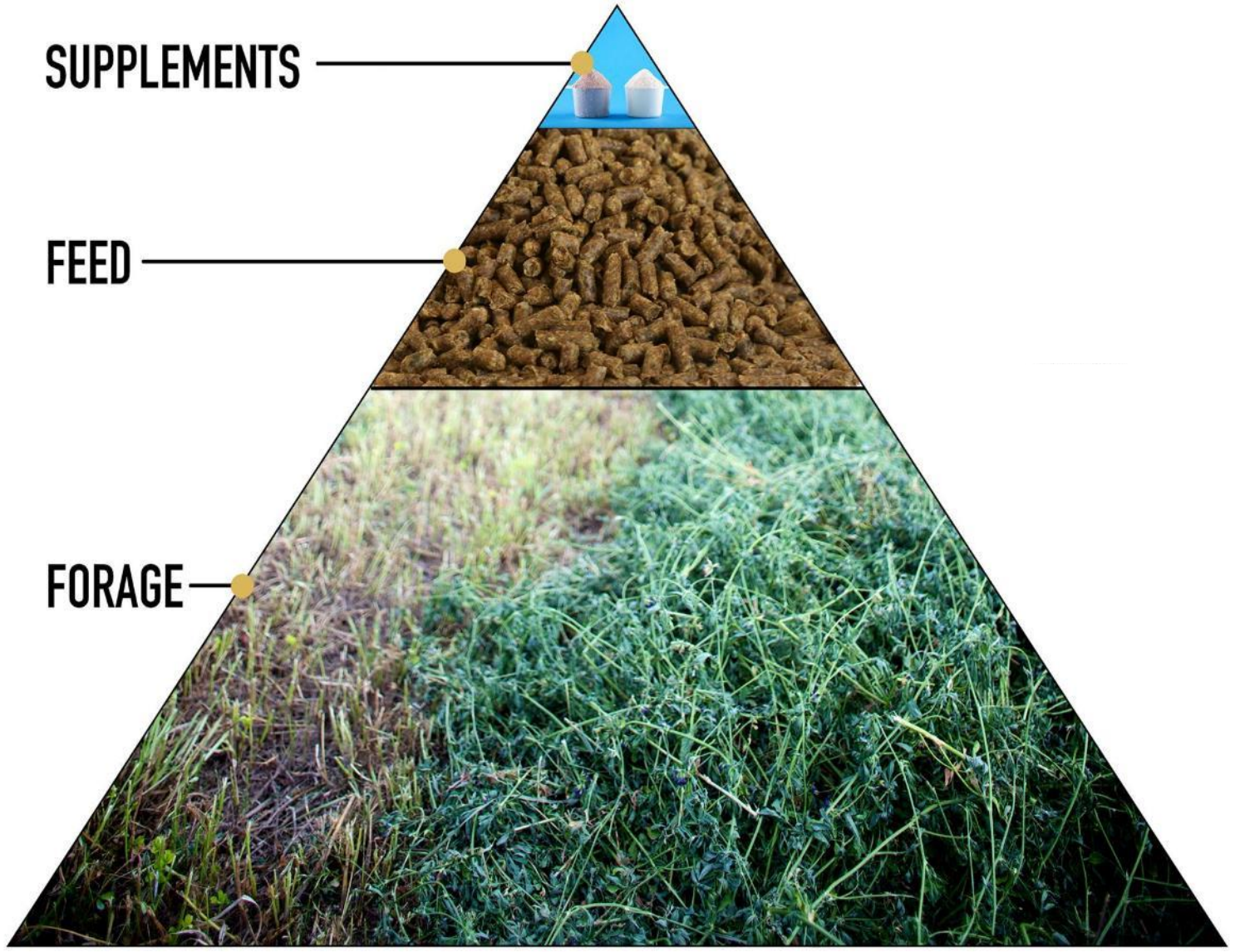
My Example



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Tying it all together

- Pay attention to the foundation
- Fill in the gaps
- Feed to recommended feeding rates

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