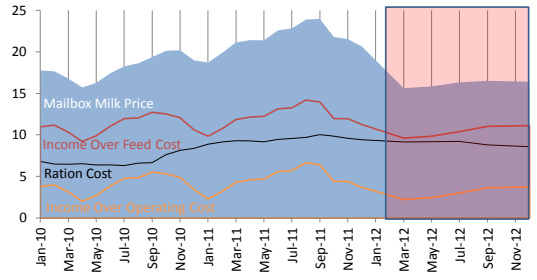
Preserving Quality Feed & Feed Quality

Patrick French

RP Feed Components
Science, Research, Service

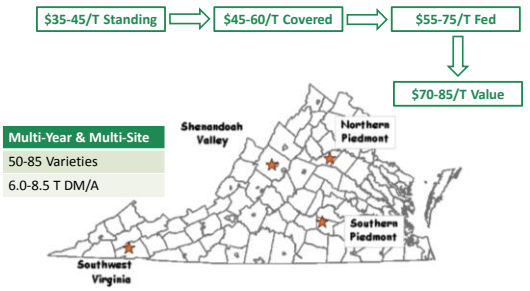
Profitability of Mid-Atlantic Dairies



Which Feeds Should We Consider?

Ingredient	lbs DM	% of DM	$/d	Days Stored	Inv $ (1,000)
Corn Silage	21.0	36.5	1.42	400	425
Alfalfa	10.2	17.8	1.02	365	279
Corn Grain	7.3	12.7	1.24	10	9.3
Wheat Grain	3.5	6.1	0.56	20	8.4
Soybean Hulls	3.4	5.9	0.26	20	3.8
Expeller SBM	2.6	4.4	0.48	8	2.9
SBM	2.8	3.8	0.49	8	2.9
Brewers	2.0	3.5	0.19	9	1.3
Condensed Solubles	2.0	3.5	0.16	14	1.7
Mineral Mix	1.3	2.3	0.65	8	3.9
Fat	0.8	1.4	0.60	14	6.3
Animal Protein	0.3	0.5	0.13	90	8.6
Total	56.6		7.19		754

Corn Yield (Silage) and Cost



Value of Corn Silage – The Hokie Way

- Grain
  - 6.0-8.5 T/A @ 35% Grain = 85-120 bu/A
  - $672-948/A or $40/T @ 35% DM
- Forage
  - 35% Mature Grass Hay, 35% Alfalfa Hay, 30% Soyhulls
  - $200/DM T or $70/T @ 35% DM
- Market Replacement of Corn Silage = $110/T

Value of Corn Silage – The Hoo Way

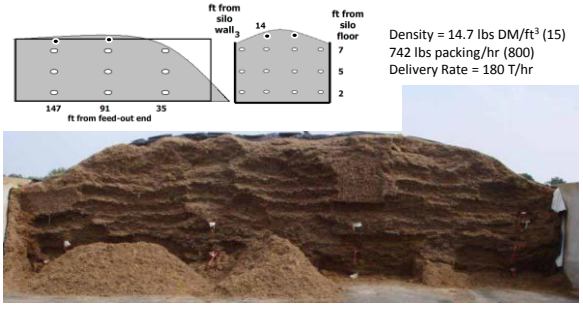
- Carbohydrates - $79/AF T
  - pt Starch = $3.29, pt Sol fiber = $8.88, pt Sugar = $1.12, and pt Digestible NDF = $1.43
- Energy - $86/AF T
  - Mcal ME = $0.10, Mcal NE = $0.15, pt TDN = $3.24
- Fiber - $82/AF T
  - pt Effective NDF = $2.45, pt Digestible NDF = $4.97

Where are the Opportunities?

Loss	Good Mgt	Not So Good Mgt
Feeding	5	7
Feed Out	3	5
Storage	10	15
Filling	1	3
Harvest	1	2
Total	20	32
COP	+$10/T	+$15/T

Holmes, 2008

How Much Silage is Lost During Storage?



Density = 14.7 lbs DM/ft^3 (15)
742 lbs packing/hr (800)
Delivery Rate = 180 T/hr

Invisible Losses in Well Packed Bunker Silos Approaches 8%

	Bottom	Middle	Top	Dome
Density, lbs DM/ft^3	17.7^a	16.7^b	14.0^c	10.5^d
DM, %	31.4^a	31.7^a	30.6^b	29.4^b
DM Loss, %	6.5^a	5.0^b	8.4^c	10.9^d

2 Upright Silos
15 lbs DM/ft^3
2.5% DM Loss

	Left	Mid-Left	Mid-Right	Right
Density, lbs DM/ft^3	13.7^a	16.2^b	15.8^b	13.2^a
DM, %	30.3^a	31.8^b	31.9^b	31.0^a
DM Loss, %	8.3	7.6	7.6	7.2

Griswold et al. (2011)

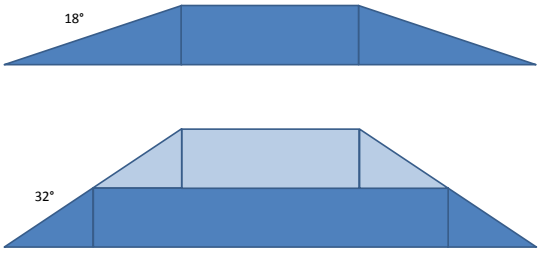
Dry Matter Loss as Influenced by Silage Density

Density (lbs DM/ft^3)	DM Loss, % (Alfalfa Silage)	DM Loss, % (Corn Silage)
10	20	9.8 (10.9)
14	17	8.1 (8.4)
15	16	7.7 (7.7)
16	15	7.3
18	13	6.5
22	10	4.8

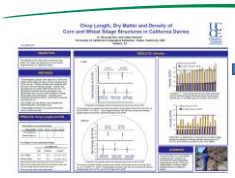
Sidewall Plastic Improves Silage Quality

Maintained DM%
4% higher NDFD
Higher acetic acid

Drive Over? Pile

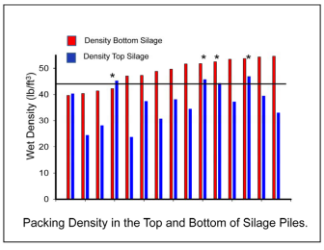


Most Piles are Not Drive-Over



22 piles
2 drive-over piles
1 bunker

The San Joaquin Valley Air Pollution Control District's Rule 4570



Packing Density in the Top and Bottom of Silage Piles.

Silage Mitigation Measures
- Cover within 72 hours of last delivery with 5 mil+;
- Density benchmarks be reached (44 AF lbs/ft³),
- Harvest at the correct moisture (≤35% DM) and TCL (≤3/4");
- Manage exposed face
- Use inoculant or acid

Or forget the above and use a sealed system (Ag-Bag)

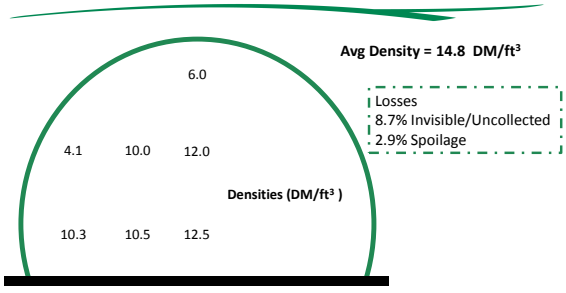
How Do You Get "Good" Density?

$$Density\ (lbs\ DM/ft^3) = (8.5 + PF \times 0.0155) \times (0.818 + 0.0136 \times D)$$

$$PF = \left(\frac{Avg\ Tractor\ Wt}{Layer\ Thickness}\right) \times \sqrt{\frac{No.\ Tractors \times DM\%}{Delivery\ Rate\ (T/hr)}}$$

- Total Tractor Weight
- Tractor Time
- Packing Layer Thickness
- Delivery Rate
- Height of Pile
- Dry Matter
- Length of Cut

Density and Loss from Bags



Muck and Holmes (2006)

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Holmes, 2008

Other Considerations for Preserving Feed

- Delivery Weight Errors
- Wind
- Birds
- Tires and Tracking
- Mixing Errors & Scale Accuracy
- Feed Refusals & Feed Bunk Management

Impact of Precision Feeding Strategies on Whole Farm Nutrient Balance and Feeding Management

Beverly Gwen Cox

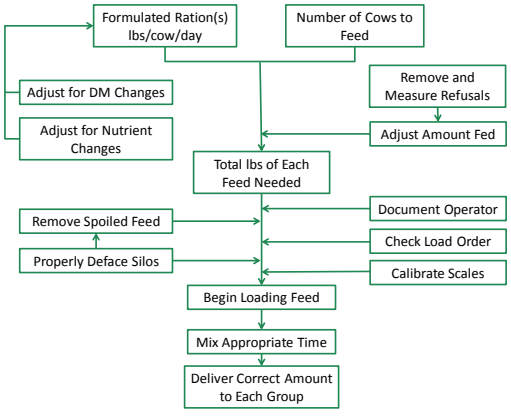
Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

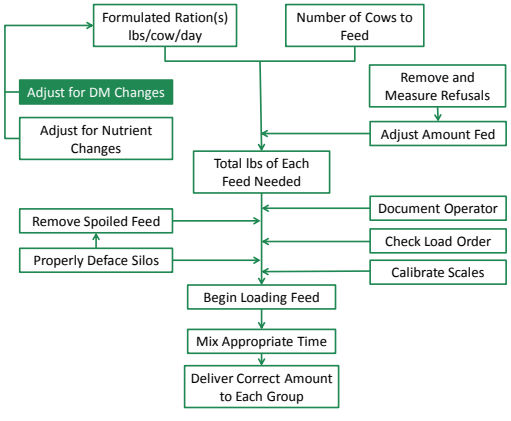
Master of Science
In
Dairy Science

Robert E. James
Michael L. McGilliard
Katharine F. Knowlton
Mark D. Hanigan
R. Michael Akers

April 13, 2007
Blacksburg, Virginia

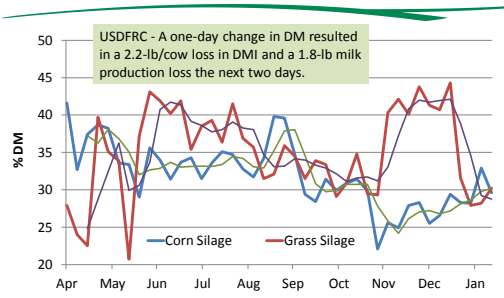
Keywords: (feed management software, whole farm nutrient balance, nitrogen, phosphorus)

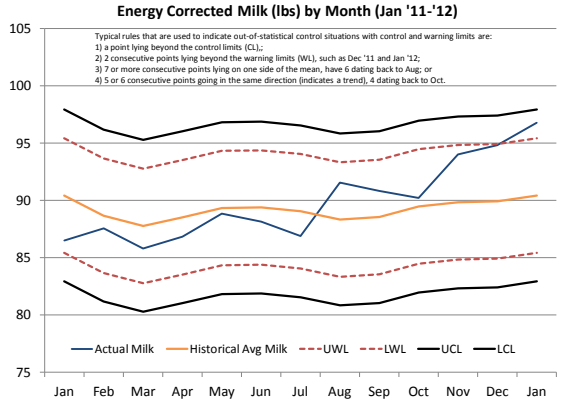




Dry Matter Variability

Silage DM Changes Over Time

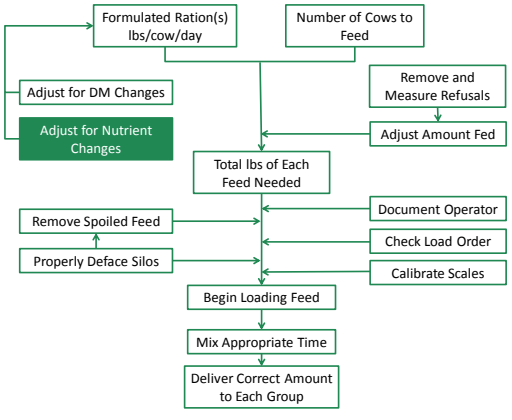




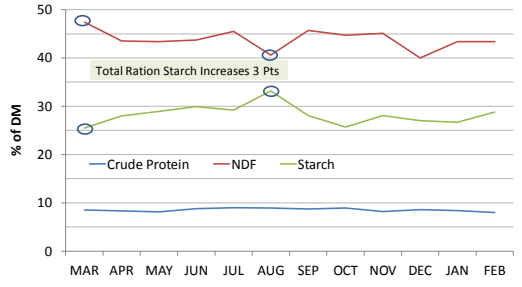
On-farm Methods for Determining Dry Matter

	Koster	Microwave	Dehydrator
Cost of equipment	$255	$50	$50-100
Scale	$50	$50	$50
Minutes/test	25 to 30	15 to 20	240
Multiple samples	no	no	yes
Attendance	+	+++	none





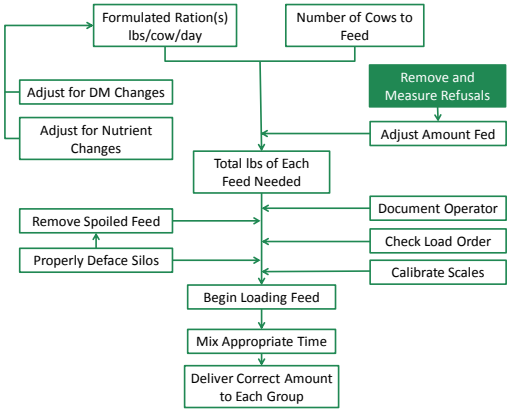
Corn Silage - Nutrient Changes Over Time



Forage Sampling Frequency by Herd Size

	Number of Milking Cows					
	50	100	200	400	800	1600
Interval between sampling, days	30	14	14	7	7	7
No. of sampling days per month	1	2	2	4	4	4
No. of samples per sampling day per forage	1	1	2	2	3	3
No. of samples per month per forage	1	2	4	8	12	12

http://www.uwex.edu/ces/crops/uwforage/ForageSamplingFrequency-FOF.pdf



Feedbunk Management

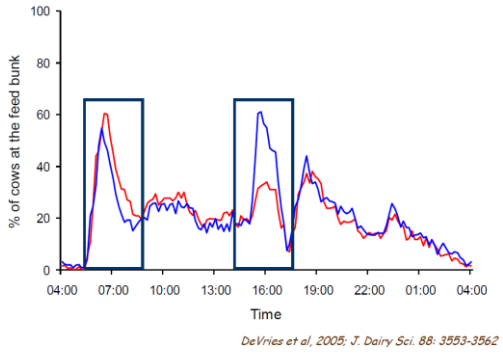
Slick-bunk Management

- Feed animals exactly what they need to achieve zero leftovers
- The idea of feeding lactating cows for a zero feed-refusal rate is usually met with resistance
  - Don't read bunks often enough
  - Overstock feeding space
- If feed-refusal rate 2-3%, you may be ready to take the next step

Feedbunk Scoring System

Score	Description
0	No feed remaining in the bunk
1	Most of the feedbunk floor devoid of feed
2	Less than 1" of feed across bottom of the bunk
3	2-3" of feed across the bottom of the bunk
4	More than 50% of the feed remaining from last delivery
5	Feed virtually undisturbed and >90% remaining

Delivery of feed twice per day

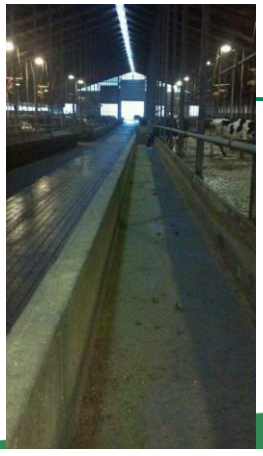


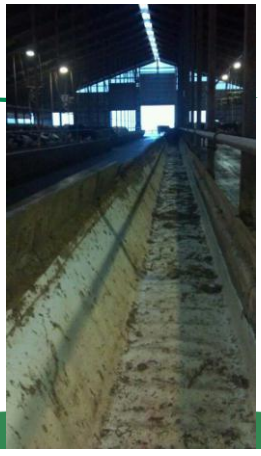
DeVries et al, 2005; J. Dairy Sci. 88: 3553-3562

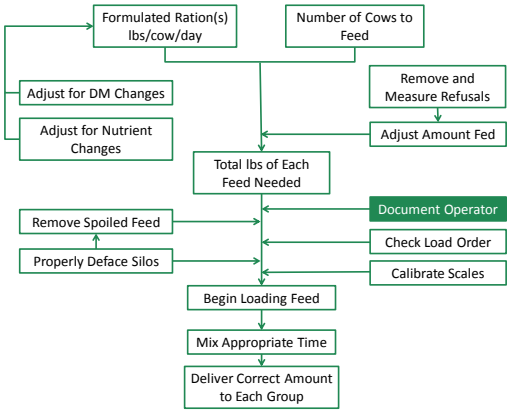
Transition Cow Index®

- System of evaluating transition cow management programs

1. Bunkspace in prefresh pen and fresh pen
2. Stall base (sand vs mattress)
3. Stall size, area
4. Move to calving pen (≤2 days vs 3+ days)
5. Screening method (4 categories)



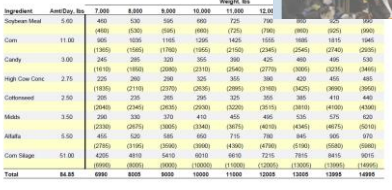




How Much and What Was Loaded, Mixed, and Delivered?

Automated

Manual

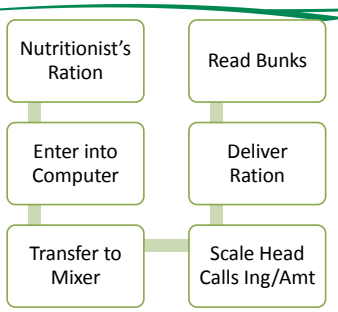


Ingredient	Amt/Day, lbs	Weight, lbs								
		7,000	8,000	9,000	10,000	11,000	12,000	13,000	13,995	14,995
Soybean Meal	5.60	460	530	595	660	725	790	860	925	990
		(460)	(530)	(595)	(660)	(725)	(790)	(860)	(925)	(990)
Corn	11.00	905	1035	1165	1295	1425	1555	1685	1815	1945
		(1365)	(1565)	(1760)	(1955)	(2150)	(2345)	(2545)	(2740)	(2935)
Candy	3.00	245	285	320	355	390	425	460	495	530
		(1610)	(1850)	(2080)	(2310)	(2540)	(2770)	(3005)	(3235)	(3465)
High Cow Conc	2.75	225	260	290	325	355	390	420	455	485
		(1835)	(2110)	(2370)	(2635)	(2895)	(3160)	(3425)	(3690)	(3950)
Cottonseed	2.50	205	235	265	295	325	355	385	410	440
		(2040)	(2345)	(2635)	(2930)	(3220)	(3515)	(3810)	(4100)	(4390)
Molds	3.50	290	330	370	410	455	495	535	575	620
		(2330)	(2675)	(3005)	(3340)	(3675)	(4010)	(4345)	(4675)	(5010)
Alfalfa	5.50	455	520	585	650	715	780	845	905	970
		(2785)	(3195)	(3590)	(3990)	(4390)	(4790)	(5190)	(5580)	(5980)
Corn Silage	51.00	4205	4810	5410	6010	6610	7215	7815	8415	9015
		(6990)	(8005)	(9005)	(10000)	(11000)	(12005)	(13005)	(13995)	(14995)
Total	84.85	6990	8005	9000	10000	11000	12005	13005	13995	14995

Feed Management Software

- TMR Tracker (Digi-Star, Fort Atkinson, WI)
- EZfeed (DHI-Provo, Provo, UT)
- Feed Supervisor (WI)
- FeedWatch (Valley Ag Software, Tulare, CA)

Feed Management Software



TMR Tracker Load Report

Load: pen2pm N

		Call Wt		Loaded Wt		Deviation		Price		
Ingredient	Time	Actual	Dry	Actual	Dry		%	Planned	Actual	Error
BIN4	09:36	851	779	850	778	-1	0.1%	$202.54	$202.30	$-0.24
PMIX	09:42	3759	2357	3750	2351	-9	0.2%	$287.42	$286.74	$-0.69
HLG22	09:44	1963	824	1950	819	-13	0.7%	$53.98	$53.63	$-0.36
CSL7	09:46	2703	973	2705	974	2	0.1%	$54.06	$54.10	$0.04
CSL8	09:47	2780	973	2785	975	5	0.2%	$55.60	$55.70	$0.10
Total		**12056**	**5906**	**12040**	**5897**	**-16**	**0.3%**	**$653.60**	**$652.46**	**$-1.14**

Delivery: pen2pm		Call Wt	Delivered Wt	Deviation		Price		
Pen	Time				%	Planned	Actual	Error
2	09:56	12056	11840	-216	1.8%	$653.57	$641.62	$-11.95
Total		**12056**	**11840**	**-216**	**1.8%**	**$653.57**	**$641.62**	**$-11.95**

Daily Emailed – Customizable Report

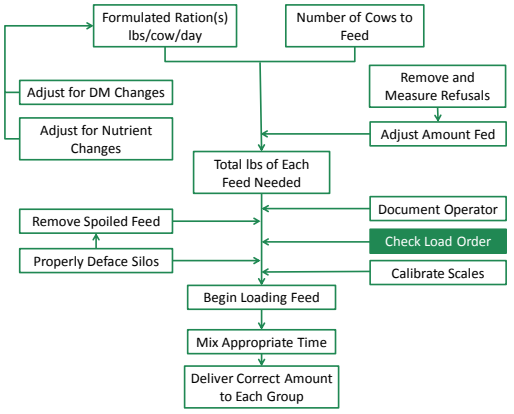
Digi-Star

Pond Hill Dairy — February 14, 2012 23:06

DM Intake per Head

Feb 09, 2012 - Feb 14, 2012

Date	Call Wt	Delivered Wt	Dry Wt	# Animals	Price	Price/Animal	W/B	W/B%	DMI
Pen : 08,8									
02/09/2012	3,020	3,015	1,213	39	$146.79	$3.76	0	0.00	31.11
02/10/2012	2,704	2,710	1,097	37	$133.16	$3.60	0	0.00	29.65
02/11/2012	2,631	2,580	1,052	36	$127.58	$3.54	0	0.00	29.21
02/12/2012	2,704	2,735	1,089	36	$132.46	$3.68	0	0.00	30.26
02/13/2012	2,479	2,485	987	33	$122.12	$3.70	0	0.00	29.92
AVG	2,708	2,705	1,088	36	$132.42	$0.27	0		30.03
Total	13,538	13,525	5,438	181	$662.10	$3.66	0		150.14
Pen : 1,1									
02/09/2012	647	660	297	10	$40.29	$4.03	0	0.00	29.70
02/10/2012	617	645	294	10	$39.89	$3.99	0	0.00	29.36
02/11/2012	802	805	368	13	$50.38	$3.88	0	0.00	28.33
02/12/2012	829	845	377	13	$52.70	$4.05	0	0.00	28.96
02/13/2012	893	910	399	14	$55.15	$3.94	0	0.00	28.49
AVG	758	773	347	12	$47.68	$0.25	0		28.97
Total	3,788	3,865	1,734	60	$238.41	$3.97	0		144.84



Loading Sequence

Vertical Mixer	Reel Mixer	Auger Mixer
Silage & Hay First	Liquids in first	Small quantity feeds neither first nor last
Mix 3-4 min to cut to core of bale	Small quantity ingredients in next	Add chopped hay last
Run Mixer while loading	Run mixer slowly while loading	Run mixer intermittently while loading
Mix and cut for 8 – 12 minutes	Mix 3 – 4 minutes after loading is complete	Mix 2 – 8 minutes after loading is complete

Buckmaster, 2005

TMR Mixer Analysis for Proper Mixer Choice

Dairy—Milking, Dry Cow, and Heifer Rations

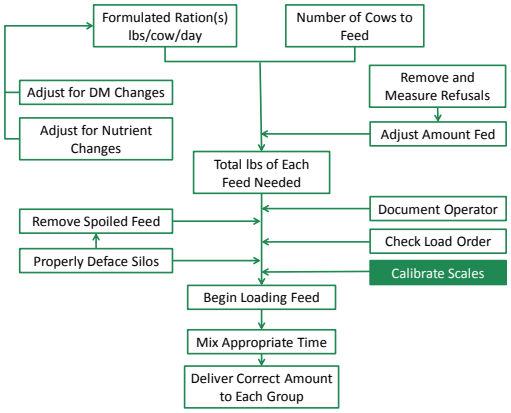
Mixers	Complete Rations					Ration Ingredients		
Mixer Type & Model	All haylage, corn silage, concentrates	Up to 20% dry hay*, haylage, corn silage, concentrate	20-50% dry hay*, haylage, corn silage, concentrate	Over 50% dry hay*, haylage, corn silage, concentrate	Balage, haylage, corn silage, concentrates	Pre-mixing of concentrates	Round bales (unprocessed)	Square bales (unprocessed)
4-Auger	☺	☺	☺	☺	⊘	☺	⊘	☺
Reel	★	★	⊘	⊘	⊘	★	⊘	☺
Vertical	☺	☺	★	★	★	☺	★	★

★ Best ☺ Good ⊘ Not Recommended

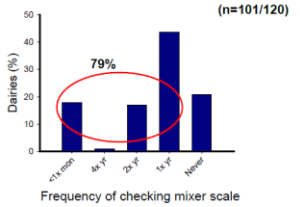
*Dry hay is good-quality alfalfa hay, both small or large square bales

This chart is a general guideline only. Individual rations vary for every operation and will affect your mixer choice.

Source: http://www.kuhnnorthamerica.com/us/product-tips-tmr-mixer-guide.html

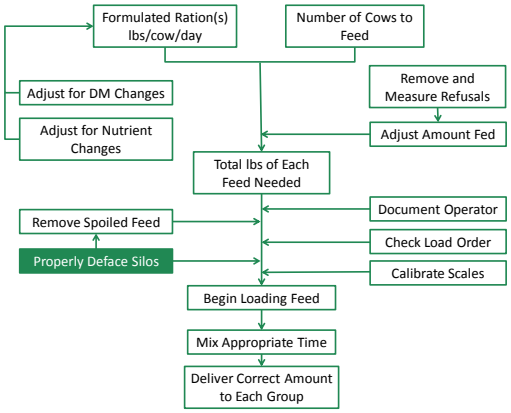


How often do you calibrate the mixer wagon scale?

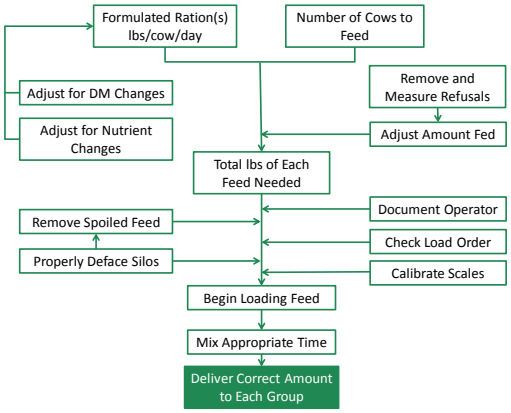


Frequency of checking mixer scale

Seventy-nine percent of producers checked the mixer scale at least once a year. But, only 19 % checked it at least monthly. The mixer wagon was calibrated by an outside service (60%) or an in house employee (40%)



Properly Managed Face


Formulated Ration(s) lbs/cow/day
Number of Cows to Feed
Remove and Measure Refusals
Adjust for DM Changes
Adjust for Nutrient Changes
Adjust Amount Fed
Total lbs of Each Feed Needed
Document Operator
Remove Spoiled Feed
Check Load Order
Properly Deface Silos
Calibrate Scales
Begin Loading Feed
Mix Appropriate Time
Deliver Correct Amount to Each Group

Thank You