Ensuring your silage stocks match you expansion plans

Robert C. Charley, Ph. D., Lallemand Animal Nutrition

Next to the escalating price of corn and the latest milk prices, possibly the most common issue confronting producers is the drive to expand, to improve operational efficiency and improve the level of profit per hunderedweight of milk produced. However, one vital point to keep in mind in any expansion plan is to ensure that adequate stocks of good quality silages are inventoried to match the growth in stock numbers. In any profitable dairy herd good quality silages form the major part of the ration and the quality of the silages available dictates the overall profitability of the operation.

It is vital to project accurately what your silage needs will be for the expansion. To do this you need to get together with your nutritional advisor and run through the relatively simple calculation below for each group of animals that will be fed different rations with a different level of silage (e.g. heifers, dry stock, young stock, fresh cows, high and low groups, etc.).

$$\frac{(\text{Number of head} \times \text{lbs silage fed} \times \text{Number of days fed})}{2000} = \text{Tons of silage needed (fresh weight)}$$

The results of the calculations for the individual groups can then be added together and converted to tons of dry matter required using an average dry matter figure (e.g. 35%).

E.g. For 200 lactating cows and 70 heifers being fed 100 lbs and 50 lbs of silage, respectively, year round:

Cows need (200 x 100 x 365)/2000 = 3650 tons fresh weight

Heifers need (70 x 50 x 362)/2000 = 639 tons fresh weight

Total silage needed = 3650 + 639 = 4289 tons, multiplied by 0.35 to convert to DM,

= 1501 tons of silage DM required

The next step is to make sure that you have adequate storage to keep this level of inventory. The tables below give approximate fresh weight storage capacities for a range of sizes of bunkers and trenches, upright silos and bags.

Estimated Fresh Weight Forage Capacities for Bunker and Trenches Containing 35–40% DM Silage

SILAGE HEIGHT (ft) & SILAGE DENSITY	SILO WIDTH (ft)	WT. SILAGE PER 4" REMOVED	SILO CAPACITY (TONS FRESH WEIGHT)* CAPACITY PER LINEAR FT.	FOR SILOS VARIOUS LENGTHS 60 ft	80 ft	100 ft
8	20	0.85	2.56	125	173	221
32 lb/ cu ft	24	1.02	3.07	150	207	265
(Range 30 –36)	30	1.28	3.84	187	259	331
12	24	1.73	5.18	249	353	456
36 lb/ cu ft	36	2.59	7.78	373	529	684
(Range 34 –38)	48	3.46	10.37	498	705	912
	60	4.32	12.96	622	881	1140
16	36	3.84	11.52	507	737	968
40 lb/ cu ft	48	5.12	15.36	676	983	1290
(Range 37 –42)	60	6.40	19.20	845	1229	1612

Silage capacity is dependent on silage density. Silage density is affected by moisture level, chop length, silage depth, and time spent packing. *Capacities given above assume back of silo is vertical and front has a slope of 2-in-one. Source: Alberta Agriculture (1988).

Approximate Forage Capacities for Upright Silos

SILO CAPACITY (TONS FRESH WEIGHT) FOR CROPS AT DIFFERENT MOISTURE LEVELS								
	HAYLAGE		CORN SILAGE		WHOLE HMC		GROUND HMC	
SILO SIZE	50%	60%	60%	65%	25%	30%	25%	30%
16x50	150	200	184	210	250	274	294	330
16x60	186	246	227	260	300	330	317	355
16x65	204	270	248	284	328	360	344	386
18 x60	243	322	293	334	385	422	404	453
18x70	290	385	350	397	450	496	474	532
20x60	310	410	370	419	477	525	502	563
20x70	370	490	440	498	560	617	590	662
20x80	433	575	510	580	644	708	678	761
24x70	562	730	650	735	816	898	858	898
24x80	660	870	754	850	937	1032	986	1108
24x90	760	1000	860	968	1060	1165	1113	1252

As you expand your herd, you will also probably need to expand your silage storage capacity: there is a limit to how high silage should be safely piled in bunkers, trenches and drive-over piles. While factors vary from operation to operation and producer preferences vary, agricultural engineers from the University of Wisconsin have analyzed the cost per ton of DM for hay silage ensiled in a range of storage structures (see Table below).

Table 10: Total Capital Cost and Annual Cost (in parenthesis) per Ton of DM for 384 and 768 tons of Stored DM

	384 tons DM		768 tons DM	
Storage type	$/ton of DM		$/ton of DM	
Steel-glass oxygen limiting (new)	427	(82)	301	(60)
Steel-glass oxygen limiting (used)	268	(55)	187	(41)
Cast-in-place oxygen limiting	285	(58)	186	(41)
Concrete stave	192	(46)	138	(36)
Above ground bunker	152	(45)	103	(37)
Packed silage pile	63	(37)	41	(32)
Bagger	88	(38)	53	(32)
Wrapped bales	64	(36)	38	(32)

(Holmes, 1998)

The table shows both the capital cost and the annual cost per ton of dry matter stored. Annual costs included annualized capital costs, labor, coverings, fuel and dry matter lost during storage. It is interesting to note that no economies of scale occurred above 758 tons of DM stored (1536 and 3052 ton storage sizes were also evaluated). From the table it is clear that piles, bags and wrapped bales offer the most economical storage options: these also involve the least capital outlay, which can be critical during expansion.

The figures in the table above assumed low DM losses from good management practices. As you expand your herd, keep focused on the importance of producing top quality silages from top quality forages. Remember that silage quality is one of the key determinants of your level of profitability. Remember the key management check points for achieving top quality silages:

Preparation: field leveling and rock removal; timing of use of fertilizers; equipment maintenance; storage structure size and condition.

Crop and variety selection: suitable to local conditions; matches your overall objectives (quantity, quality, energy and protein levels).

Harvest timing: optimum stage of growth; optimum plant moisture level.

Cutting and chopping: cutting height; optimum TLC (chop length); processing (corn silage <30% DM).

Inoculant: proven to deliver desired results; fermentation enhancement/ aerobic stability; applicator calibration.

Filling and packing: quick fill; maximum 6" layers; packing weight adequate for forage delivery rate; packing time adequate (minimum density 15 lb DM/ ft^3; seal silo quickly and effectively.

Feedout: rate adequate to prevent heating; discard spoiled silage; balance ration properly to silage quality from silage analyses.

Table for bags:

Approximate silage bag fresh weight capacities (35% DM silage packed at 15 lb DM/ ft^3):

	Bag diameter (ft)					
	8		**10**		**12**	
Bag length (ft)	**Silage length (ft)**	**Capacity (t DM)**	**Silage length (ft)**	**Capacity (t DM)**	**Silage length (ft)**	**Capacity (t DM)**
100	84	90	80	134	76	183
150	134	146	130	218	126	305
200	184	197	180	302	176	425
250	234	251	230	386	226	546
300	284	305	280	470	276	667