Field Efficiency Considerations When Selecting Equipment

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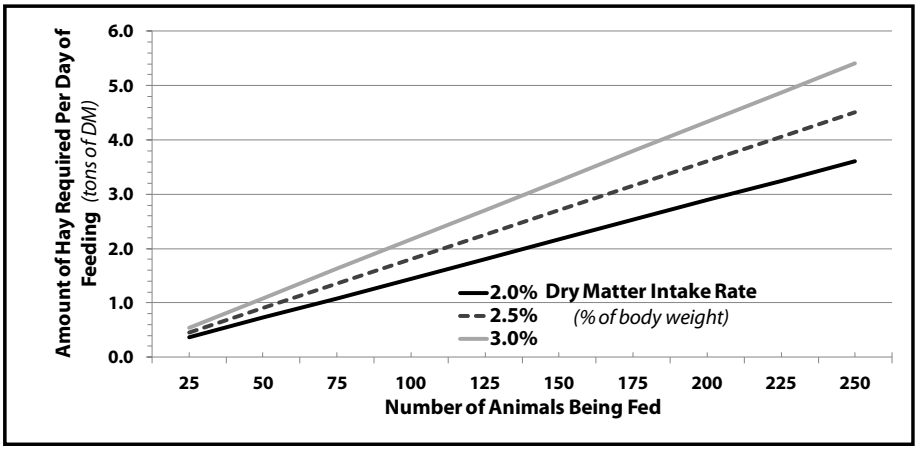
Are you in the market to replace or upgrade hay equipment? When making the decision, one should consider how the new piece or pieces of equipment fit into their "hay making system." Note the term "hay making system" is purposefully used. This is because each piece of equipment (e.g., mower, tedder, rake, baler) needs to match the size and field efficiency of the other pieces of hay making equipment. Even if just one piece is not as efficient as the others, it can create a bottleneck. This can increase rain damage risk, lower hay quality, and increase per ton cost.

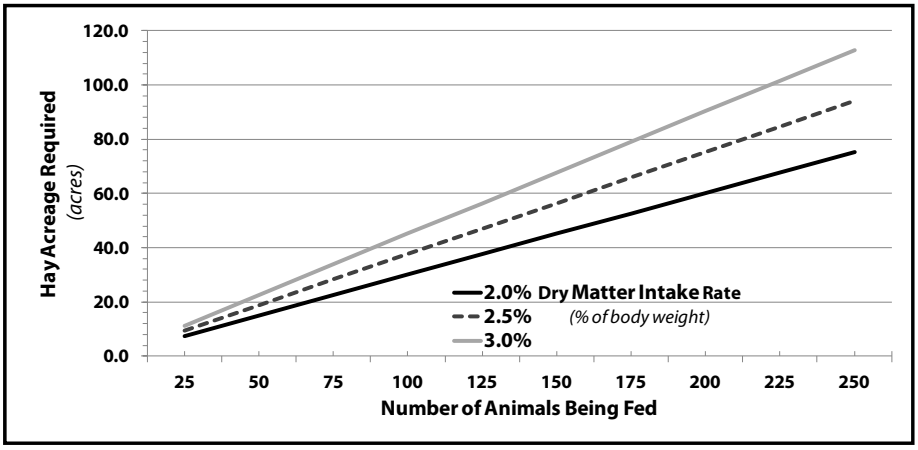
One of the most important considerations in any purchase is the price. The farm owner/manager, with the assistance of one's extension educator as needed, can determine what an individual farm should be able to afford. Each farm is different. Nonetheless, generalizations can be made as to what will minimize the number of man-hours required to make the amount of hay required.

Figure 1. Daily hay required for herds of increasing size, if taking in 2.0, 2.5, or 3.0% of their body weight on DM basis. Assumes ave. weight is 1,300 lbs; 10% hay loss during feeding/refusal.



The first step is to get a handle on amount of hay needed. Figure 1 shows how much hay is needed for each day of feeding based on herd size. Once the amount is determined, the number of hay acres can be estimated. Figure 2 uses estimates from Figure 1 and provides an estimate of hay acres needed. For example, a 100 head of 1,300 lb beef cows that eat ~2.5% of their body weight will need ~1.8 tons of hay each day. If feeding for 100 days, 180 tons of hay will be needed. Assuming fields yield 6 tons of dry matter per acre (5 cuttings/year) and there is 20% loss during harvest and storage, this will require at least 38 acres of hay production.

Figure 2. Number of hay acres required to feed herds of increasing size, if taking in 2.0, 2.5, or 3.0% of their body weight on DM basis. Builds on Figure 1 assumptions. Assumes ave. annual yield is 6 tons DM/ac; 20% of crop is lost during hay harvesting and storage.



Once it is determined how many acres must be harvested and how many cuttings are necessary, comparisons of field efficiency need to be considered. Table 1 provides estimates of field efficiency for different equipment in the cutting, tedding, and raking portions of the hay making system. When dealing with cutting, tedding, and raking, efficiency is determined in acres per hour. Hay baling depends primarily on the raking step to ensure a sufficiently sized windrow allows the baler to function efficiently. Thus, when comparing efficiency of baler options, focus on tons of hay baled per hour. Table 2 provides estimates of field efficiency for baler types.

Recall that to obtain hay needed for a 100-day feeding period, 5 cuttings per year on 38 acres is needed. Let's assume a 6' 8" disc mower (no conditioner), a 16' 6" tedder used the afternoon after cutting and again the next morning (2 passes/cutting), an 8' 6" side delivery/parallel bar rake, and a round baler that makes 4' wide and 5' tall bales are used. Using Tables 1 and 2, we can determine ~132 man-hours per year are needed (about 26.4 hrs per cutting).

Now let's assume the purchase of a 10' 4" disc mower-conditioner, a 25' tedder (2 passes/cutting), a 19' wheel rake, and a 4' x 6' baler are being considered. Again using Tables 1 and 2, we can estimate that the labor requirement is reduced to less than 62 man-hours per year (about 12.4 hrs per cutting), which is more than a 50% reduction in man-hours.

This is an extreme example. It has been a decent year for profitability, but it hasn't been so great as to provide enough money to buy all new hay equipment. Usually, producers will change one or two elements at a time. In this case, the biggest efficiency improvement was made with the large wheel rake (78% less time). But, all changes in equipment size made for significant time savings. Though changing to a larger baler had the smallest saving labor effect, it is worth pointing out that the time spent baling is often the time when hay is at greatest risk of being rain damaged.

Though these field efficiency values are estimates, they can be useful in comparing equipment. Before making an investment in a new piece of hay making equipment, do more than look at the price tag. In addition to its cost, consider how the implement will fit in your system, whether or not it will match your other equipment, and its potential to save time.

Table 1. Specifications and field efficiency estimates for mowing, teddering, and raking.

Operating Width	HP Required	Max. Speed (mph)	Acres/ Hour	Tons/ Hour	Man-Hours/ Ton
DISC MOWER					
6' 8"	45	8	5.1	6	0.16
7' 10"	55	8	6.0	7	0.14
9' 2"	60	8	7.1	9	0.12
DISC MOWER CONDITIONER					
9' 2"	65	8	7.1	9	0.12
10' 4"	80	8	8.1	10	0.10
13'	90	8	10.3	12	0.08
TEDDER					
16' 6" (4 rotors)	30	9.3	14.5	17	0.06
25' (6 rotors)	47	9.3	22.0	22	0.04
33' 6" (8 rotors)	60	9.3	29.5	35	0.03
SIDE DELIVERY, PARALLEL BAR RAKE					
8' 6"	30	4	3.3	4.0	0.25
9' 6"	30	4	3.7	4.4	0.23
WHEEL RAKE					
16' 4" (8 wheels)	30	8	12.7	15.20	0.07
19' (10 wheels)	30	8	14.7	17.69	0.06
21' 8" (12 wheels)	50	8	16.8	20.17	0.05
33' 5" (18 wheels)	55	8	25.9	31.11	0.03

Table 2. Specifications and field efficiency estimates for different sizes/types of hay balers.

Bale Size	HP Required	Volume (ft^3)	Bale Weight (lbs)	Tons/ Hour	Man-Hours/ Ton
SMALL SQUARE BALER					
14" x 18" x 36"	35	5.3	45-55	3.41	0.29
14" x 18" x 36"	75	5.3	60-70	4.86	0.21
ROUND BALER					
4' wide x 5' tall	60	76.1	850-900	21.00	0.08
5' x 5'	70	100.6	1150-1250	27.00	0.05
4' x 6'	80	102.4	1200-1330	28.13	0.04
5' x 6'	80	135.4	1650-1750	35.70	0.03
LARGE SQUARE BALER					
36" x 32" x 7.5'	102	58.1	1000-1150	30.00	0.03
36" x 48" x 7.5'	122	87.2	1500-1650	45.00	0.02