FIELD EFFICIENCY CONSIDERATIONS WHEN SELECTING HAY EQUIPMENT

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Each year, I try to provide the readers of this magazine a little something to ruminate on as they prepare to attend the Sunbelt Agricultural Exposition. "Expo," as we all call it, is a great resource for our agriculture industry in the South. No other venue in our region provides such an opportunity to review all of the industry's latest offerings at the same time and in the same location, often in head-to-head competition.

Given that the beef cattle industry has had a banner year, cattlemen have a rare opportunity to replace or upgrade hay equipment. But, when making these decisions, one should consider how the new piece or pieces of equipment fit into their "hay making system." Notice that I purposefully used the term "hay making system." This is because each piece of hay making equipment (e.g., the mower, tedder, rake, baler, etc.) needs to match the size and field efficiency of the other pieces of hay making equipment. Even if just one piece of equipment is not as efficient as the others, it can create a bottleneck in the process. This can increase the risk of rain damage, lower the quality of the hay, and increase the cost of operation per ton.

One of the most important considerations in any purchase is, of course, the price. I must admit at the outset here that it would be inappropriate in an article such as this to specify what is right for your farm. The farm owner/manager, with the assistance of one's County Agent or Extension Economist as needed, can determine what an individual farm should or should not be able to afford. Each farm is different. Nonetheless, some generalizations can be made as to what will minimize the number of man-hours required to make the amount of hay that is required.

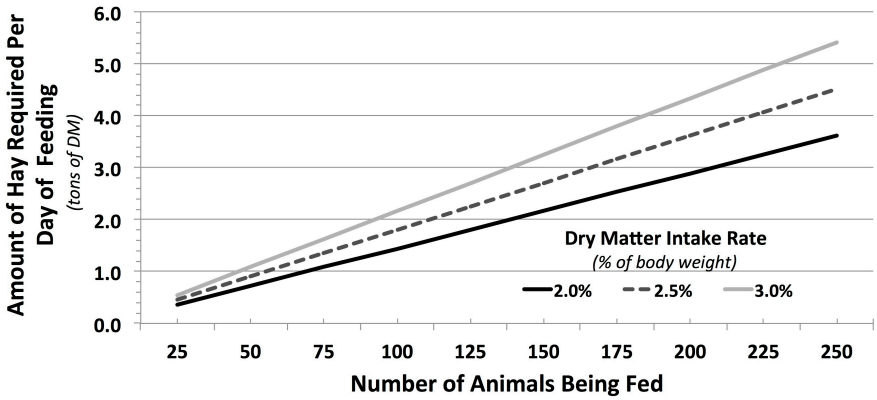

Figure 1. The daily amount of hay required to feed herds of increasing size, if the animals are taking in 2.0, 2.5, or 3.0% of their body weight on a dry matter basis. This assumes the average animal weight is 1300 lbs and only 10% of the hay is lost during feeding or as a result of refusal.

The first step is to get a handle on the amount of hay that is needed. Figure 1 illustrates how much hay may be necessary for each day of hay feeding based on the size of one's herd. Once the amount of hay that is needed is determined, the number of hay acres can be estimated. Figure 2 uses the assumptions and estimates from Figure 1 and provides an estimate of the number of hay acres needed to produce the amount of hay required. For example, a cattlemen that has 100 head of 1300-lb beef cows that eat about 2.5% of their body weight will need approximately 1.8 tons of hay for

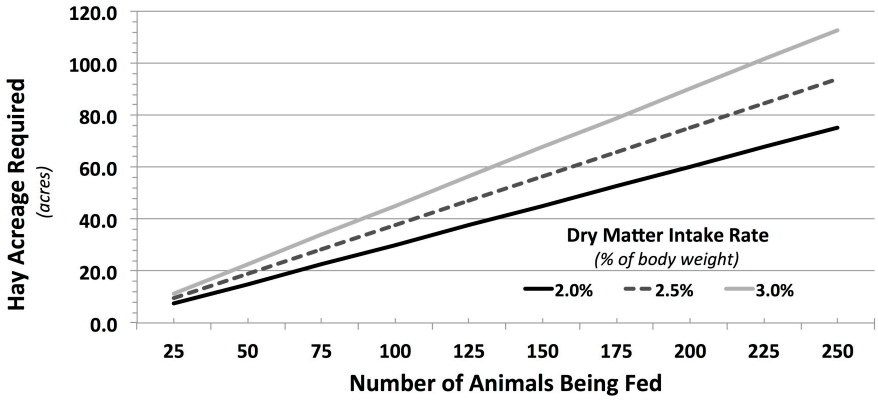

Figure 2. The number of acres of hay required to feed herds of increasing size, if the animals are taking in 2.0, 2.5, or 3.0% of their body weight on a dry matter basis. This builds on the assumptions in Figure 1, as well as assuming that the average annual forage yield is 6 tons of DM/acre and that 20% of the crop is lost during hay harvesting and storage.

each day that he feeds hay. If he feeds hay for 100 days, that is 180 tons of hay for the season. Assuming that his hayfields yield about 6 tons of dry matter per acre in a given year (5 cuttings per year) and that he only loses 20% during the process of making and storing the hay, this producer will need to make hay on at least 38 acres.

Once it is determined how many acres must be harvested and how many cuttings are necessary, some comparisons of field efficiency need to be considered. Table 1 provides estimates of field efficiency for different pieces of equipment in the cutting, tedding, and raking portions of the hay making system. When dealing with the cutting, tedding, and raking steps, the key aspect is the efficiency of each operation in terms of acres per hour. In contrast, the hay baling operation depends primarily upon the raking step to ensure that a sufficiently sized windrow has been created to allow the baler to function at peak efficiency. Therefore, when comparing the field efficiency of different baler options, focus on the tons of hay that can be baled per hour. Table 2 provides estimates of field efficiency for a selection of different baler types.

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

Operating Width	HP Required	Max. Speed (mph)	Acres/ Hour	Tons/ Hour	Man-Hours/ Ton
1) 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
2) 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
3) TEDDER					
16′ 6″ (4 rotors)	30	9.3	14.5	17	0.06
25′ 0″ (6 rotors)	47	9.3	22.0	22	0.04
33′ 6″ (8 rotors)	60	9.3	29.5	35	0.03
4) 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
5) 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 and types of hay balers.

Bale Size	HP Required	Volume (ft^3)	Bale Weight (lbs)	Tons/ Hour	Man-Hours/ Ton
1) 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
2) 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
3) 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

Specifications and field efficiency estimates in the above tables were adapted from the "*New Holland Haymaker's Handbook*" and information on CNH Industries, John Deere, Hesston/Massey Ferguson, and Vermeer websites for their hay equipment. Mention of company name or product information does not imply an endorsement by the University of Georgia or the Georgia Cattlemen's Association.

Perhaps the easiest way to understand how to evaluate a hay making system is to provide an example. Let's continue with the example of the producer with 100 head of beef cattle mentioned previously. You'll recall that to get the hay that he needs for his 100-day feeding period, he will need to take 5 cuttings per year off of 38 acres of hay. Let's assume that the producer currently has a 6' 8" disc mower (no conditioner) to cut the crop, a 16' 6" tedder that he uses the afternoon after cutting and again the next morning (2 passes/cutting), a 8' 6" side delivery/parallel bar rake, and a round baler that makes 4' wide and 5' tall bales. Using the estimates provided in Tables 1 and 2, we can estimate that the producer uses approximately 132 man-hours per year making his hay (about 26.4 hrs per cutting; Table 3).

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

Table 3. Labor required in the beef cattle producers' original scenario.

Original Scenario	Labor
	(hrs/year)
Disc mower (6' 8")	37.25
(38 acres x 5 cuttings/yr ÷ 5.1 acres/hr)	
Tedder (16' 6")	26.21
(38 acres x 5 cuttings/yr x 2 passes/cutting ÷ 14.5 acres/hr)	
Side delivery rake (8' 6")	57.58
(38 acres x 5 cuttings/yr ÷ 3.3 acres/hr)	
Round Baler (4' x 5' bales)	10.86
(38 acres x 5 cuttings/yr x 1.2 tons/acre ÷ 21 tons/hr)	
Total Hours	**131.89**

Table 4. Labor required by the beef cattle producer if he purchased the new equipment.

Alternative Scenario	Labor
	(hrs/year)
Disc mower-conditioner (10' 4")	23.46
(38 acres x 5 cuttings/yr ÷ 8.1 acres/hr)	
Tedder (25')	17.27
(38 acres x 5 cuttings/yr x 2 passes/cutting ÷ 22.0 acres/hr)	
Wheel rake (19')	12.93
(38 acres x 5 cuttings/yr ÷ 14.7 acres/hr)	
Round Baler (4' x 6' bales)	8.11
(38 acres x 5 cuttings/yr x 1.2 tons/acre ÷ 28.13 tons/hr)	
Total Hours	**61.76**

Of course, this is an extreme example. It has been a great year in the beef industry, 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 improvement in efficiency was made in the change to a large wheel rake (78% less time involved). But, all of the changes in equipment size made for significant time savings. Though changing to a larger baler had the smallest effect on saving labor, it is worth pointing out that the time spent baling is often the time wherein the hay is at greatest risk of being damaged by rain.

Though these field efficiency values are estimates, they can be very useful in comparing pieces of 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 you time. If you have additional forage management questions, visit or contact your local University of Georgia Cooperative Extension office by dialing 1-800-ASK-UGA1.