



Survey of Forage Harvesting in Missouri

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Introduction

A survey was conducted at the end of the 1979 haying season to get a better understanding of the hay harvesting methods Missouri farmers use. The survey population consisted of 3225 farmers who comprised a cross-section of economic enterprises, geographic locations and farm sizes.

It was hypothesized that the primary economic enterprise of a farm might influence the selection of field machines. That is, a dairyman might place more emphasis on hay quality than a cow-calf cattleman and choose a different harvesting method. The objective of the survey was to try to answer the following questions:

1. What hay harvesting methods are generally used?
2. How general is the use of the large round bale?
3. What percentage of baled hay is stored outside?
4. What machines comprise a typical hay harvesting system for:
 - a. Small square bales?
 - b. Large round bales?

Survey Tabulation

The 1577 responses were sorted by primary economic enterprise--as identified by the first question. Enterprise categories included:

Beef - 980 responses
Swine - 263 responses
Dairy - 139 responses
Grain - 64 responses
Hay - 32 responses

For 99 respondents, no single outstanding enterprise could be identified and they were not included in the tabulation.

Survey Results

Table 1 lists the tons of forage reported by each enterprise category. Generally, dairymen use more forage--especially silage--than farmers in any other category. Loose hay was not used much by any category and comprised only 1.7 percent of the total forage harvested.

Table 2 lists the total acreages of hay reported by each enterprise category as well as the percentage of the total used for fescue, alfalfa and clover. The acreage not accounted for by these three crops was in orchard grass, timothy or a grass-legume mixture. Fescue was the most popular hay crop except among dairymen who used more alfalfa.

The percentages of hay baled in square bales, small round bales, and large round bales are listed in Table 3. The average bale weights, which are also listed, seem realistic. A small percentage of farmers were using the small round baler; they prefer this machine under certain conditions and keep one on hand in addition to other balers. Dairymen and commercial hay producers prefer square bales. Grain farmers prefer large round bales. Other enterprise categories were almost evenly divided between square bales and large round bales. Cattlemen, who reported the greatest use of small round bales, indicated a slight preference for square bales.

The storage preference of each category is listed in Table 4. Since some respondents omitted this question, the number of responses given is less than on previous tables. Those with grain as a primary economic enterprise seem more likely to store hay outside. Dairymen and commercial hay producers tend to store more hay inside. Since poor outside storage practices cause loss in quality and quantity of forage, the total potential loss has considerable economic value.

Table 5 presents the percentage of survey respondents who hired custom work. Except for dairymen, who hired less custom work done than other enterprise categories, about half the farmers hire some work done. The most frequently reported custom operation was baling. The number reporting custom hauling and storage was less than expected. This may be because much custom baling is done with a large round baler. The large round bales can be temporarily left in the field before being stored when the farmer finds time to do it.

Respondents were asked to rate seven hay harvesting methods (including small square bales, large square bales, small round bales, large round bales, loose hay, cubes, silage and direct cut) on a scale of 1 (best) to 10 (poorest). Only three methods (small square, small round, and large round bales) were preferred by enough respondents to be reported here. An exception to this was the overall weighted rating of 3.33 given silage by dairymen. Some respondents indicated in written comments that they felt unqualified to rate the seven methods. Therefore, the "number answering the question" in Tables 6, 7 and 8 is less than the total number of respondents.

Ratings for small square bales are given in Table 6. Columns 3 and 4 indicate how many in each category considered small square bales to be the best method. Column 5 gives the overall weighted rating for each category. The best rating was given by dairymen. (The smaller the number, the better the rating.)

Ratings for small round bales are given in Table 7. The overall weighted ratings for all economic enterprises were low.

Table 8 lists ratings for large round bales. Overall ratings for all categories were similar. Use of large round bales seems to be generally accepted by all economic enterprises. Cattlemen were expected to give large round bales a higher rating than other categories. As indicated in Table 8, this did not happen.

One objective of the survey was to find which machines--and how many of each--are typically used in a hay harvesting machine system. Respondents were requested to list the number of the following machines used during the 1979 hay harvest:

Tractor	Self-propelled Handler
Windrower-Conditioner	Automatic Bale Wagon
Rake	Loose Hay Stacker
Square Baler	Field Cuber
Round Baler	Direct-cut Forage Harvester

The machines included in Table 9 were frequently listed by respondents. Machines not included in Table 9 were seldom used. Since it was assumed that

everyone would have a side-bar mower, this machine was not included in the list. The term, self-propelled handler, was intended to include loading mechanisms used to lift square bales from the ground to a moving truck or wagon. Only 2.5 percent listed such a machine. However, in written comments, many indicated that such a machine was used--usually with a truck.

The number of tractors reported in Table 9 varied from one to four per respondent. An average of almost two (1.96) tractors were used for hay harvesting in all enterprise categories. In most cases, at least one tractor was old. Many 8N Ford, H Farmall and A John Deere tractors were reported. In a small square bale machinery system, the pto power rating was usually less than for a large round bale system. For example, a typical square bale system had two tractors with 30 and 50 pto hp. A typical large round bale system had two tractors with 35 and 75 pto hp.

The use of a self-propelled or trailed windrower-conditioner was greatest among dairymen. Almost everyone reported use of a side delivery rake. At least 50 percent of respondents in each enterprise category reported use of a small square baler.

A question on custom rates was included to get some idea of price variation throughout the state. The rates for baling were:

	<u>Range</u>	<u>Typical Rate</u>
Small Square Bale	18¢-40¢/bale	25¢/bale
Small Round Bale	15¢-45¢/bale	25¢/bale
Large Round Bale	\$3.50-\$12.50/bale	\$6.00/bale

There was more variation in hay harvesting custom rates throughout the state than was anticipated.

Summary and Conclusions

The forage harvesting systems in general use were baling (small square, small round and large round) and ensiling, which was primarily used by dairymen. As indicated in Table 3, the order of preference for swine and grain enterprises was large round, small square, and small round. For all other economic enterprises, the order was small square, large round and small round.

All enterprise categories report use of the large round baler. Of all baled hay reported, 42.3 percent was in large round bales. Reduced labor seems to be the main incentive for use of large round bales. The large round bales are more difficult to haul long distances--which may account for limited use by commercial hay producers.

Much hay is stored outside--as shown in Table 4. Even commercial hay producers and dairymen, who were expected to be most concerned about feeding quality, stored some hay outside.

There was considerable variation among hay harvesting systems. Some involve many people and machines; others get by with barely adequate machines and as little labor as possible.

A typical hay harvesting system for small square bales was:

- 2 tractors (30 pto hp and 50 pto hp)
- 1 sickle-bar mower
- 1 side delivery rake
- 1 baler
- 1 truck with automatic bale-loading attachment

A typical hay harvesting system for large round bales was:

- 2 tractors (35 pto hp and 75 pto hp)
- 1 trailed windrower-conditioner
- 1 side delivery rake
- 1 baler
- 1 bale-moving device (usually a 3-point attachment for the larger tractor or an attachment for a pickup truck)

It seems that many farmers use more than one hay harvesting method. Many own one kind of baler (usually small square) and custom hire another (usually large round). Some own both round and square balers. Square bales are often stored inside as a hedge against an unusually high need for forage or an unfavorable forage year. The bales may be stored more than one year.

Round bales are often used for lower quality forage. The low labor requirement is definitely an incentive. Some apparently do not realize how much hay they are losing by storing large round bales outside. Written comments indicate that others recognize the loss and are willing to accept it for reduced labor and ease of feeding.

Table 1. Forage Harvested

Primary Enterprise	Responses	Silage (tons)		Loose Hay (tons)		Baled Hay (tons)	
		Total	Average	Total	Average	Total	Average
Cattle	980	8,535	8.70	1,809	0.18	104,616	106.75
Swine	263	3,360	12.77	1,328	5.04	33,122	125.93
Dairy	139	18,997	136.66	554	3.98	27,529	198.05
Grain	64	150	2.34	0	0	5,477	85.57
Hay	<u>32</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>2,271</u>	<u>70.96</u>
TOTAL	1,478	31,042	21.00	3,691	2.49	173,015	117.06
Percent of Forage Harvested		(14.9)		(1.7)		(83.2)	

Table 2. Hay Crops Reported

Primary Enterprise	Responses	Acres of Hay		Fescue (%)	Alfalfa (%)	Clover (%)
		Total	Average			
Cattle	980	47,650	48.62	48	11	11
Swine	263	12,810	48.70	45	12	13
Dairy	139	10,484	75.42	31	32	11
Grain	64	2,626	41.03	48	11	6
Hay	<u>32</u>	<u>1,063</u>	<u>33.21</u>	81	8	6
TOTAL	1,478	74,633	50.49			

Table 3. Bale Preference and Average Bale Weight

Primary Enterprise	Small Square Bales		Small Round Bales		Large Round Bales	
	% of Total	Average Weight (lbs)	% of Total	Average Weight (lbs)	% of Total	Average Weight (lbs)
Cattle	50	58	10	57	40	1,095
Swine	44	55	7	54	49	1,161
Dairy	60	57	3	63	37	1,078
Grain	29	57	5	52	66	1,080
Hay	84	56	4	63	12	1,086

Table 4. Bale Storage (Percent of those who answered question)

Primary Enterprise	Number Answering Question	All Stored Inside (%)	All Stored Outside (%)	Some In--Some Out (%)
Cattle	927	50	15	35
Swine	249	37	15	48
Dairy	129	58	6	36
Grain	54	35	32	33
Hay	29	62	10	28
TOTAL	1,388			

Table 5. Custom Work Hired

Primary Enterprise	Responses	Hired Custom Operator (%)	Mow (%)	Rake (%)	Bale (%)	Haul and Store (%)
Cattle	980	49	24	23	24	22
Swine	263	44	18	13	40	12
Dairy	139	30	13	9	27	11
Grain	64	48	39	28	45	20
Hay	32	63	44	44	59	28
TOTAL	1,478					

Table 6. Harvest Method Rating (Small Square Bales)

Primary Enterprise	Number Answering Question	Rated No. 1		Overall Weighted Rating
		Number	Percent	
Cattle	649	272	41.9	3.44
Swine	209	74	35.4	3.53
Dairy	109	57	52.3	2.88
Grain	44	16	36.4	3.52
Hay	26	11	42.3	3.57
TOTAL	1,037			

Table 7. Harvest Method Rating (Small Round Bales)

Primary Enterprise	Number Answering Question	Rated No. 1		Overall Weighted Rating
		Number	Percent	
Cattle	476	65	13.7	5.22
Swine	154	21	13.6	5.37
Dairy	72	9	12.5	6.55
Grain	32	2	6.3	5.66
Hay	<u>13</u>	3	2.3	4.15
TOTAL	747			

Table 8. Harvest Method Rating (Large Round Bales)

Primary Enterprise	Number Answering Question	Rated No. 1		Overall Weighted Rating
		Number	Percent	
Cattle	553	154	27.8	4.10
Swine	185	67	36.2	3.62
Dairy	89	22	24.7	3.87
Grain	42	17	40.5	3.95
Hay	<u>14</u>	5	35.7	3.00
TOTAL	883			

Table 9. Machines Included in Hay Harvesting System (Average number per response)

Primary Enterprise	Responses	Tractor	Windrower- Conditioner	Rake	Small Square Baler	Small Round Baler	Large Round Baler
Cattle	980	1.9	.43	.92	.68	.16	.38
Swine	263	2.0	.46	.98	.69	.18	.52
Dairy	139	2.3	.75	1.00	.81	.05	.46
Grain	64	1.7	.33	.73	.52	.10	.42
Hay	<u>32</u>	1.9	.25	1.00	.78	.12	.22
TOTAL	1,478						