Some Effects of Wool Baling on Transportation

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The Farmer Cooperative Service conducts research studies and service activities of assistance to farmers in connection with cooperatives engaged in marketing farm products, purchasing farm supplies, and supplying business services. The work of the Service relates to problems of management, organization, policies, financing, merchandising, product quality, costs, efficiency, and membership.

The Service publishes the results of such studies; confers and advises with officials of farmer cooperatives; and works with educational agencies, cooperatives, and others in the dissemination of information relating to cooperative principles and practices.

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SUMMARY

Farmer Cooperative Service recently made a preliminary survey to determine what effect baling has had on wool handling and transportation.

Chief facts brought out by the survey follow:

1. Before 1955, some wool was baled but most of it was shipped in bags.

2. Wool handlers in Texas began baling in 1955. By 1957, the practice had caught on among warehousemen in the West and the Midwest.

3. Baling has resulted in reduced transportation, handling, and storage costs for some producing area warehouse operators.

4. Competitive factors brought about by baling were largely responsible for rail rate reductions on wool during 1958 and 1959.

5. Truckers and steamship companies are strong competitors for hauling baled wool but are less competitive with railroads for long-haul shipments of wool in bags.

6. Baling machinery and methods are not uniform from firm to firm. Engineering studies may be needed to determine what size bale is best for handling and transportation.

7. Most manufacturers and topmakers have a favorable attitude toward baled wool.

8. Bales are considered better than bags for accuracy and efficiency of core sampling.

9. There will probably be an increase in baling wool by producing area warehousemen, especially if reduced freight rates for heavier carloadings become available.

WOOL BALING AND ITS EFFECT ON TRANSPORTATION

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Before 1955, most United States wool was shipped in bags. Since that time, handlers have increasingly baled wool. Farmer Cooperative Service -- in cooperation with other agencies in the U. S. Department of Agriculture and the Texas Transportation Institute, Texas A&M College, College Station, Tex. -- is conducting a study of wool transportation methods and costs in the United States.

Because of the effect of baling on wool transportation, Farmer Cooperative Service made a preliminary survey of wool marketing and handling firms known to be baling wool to determine the following: Type of baling facilities used, effects of baling on transportation costs and facilities, and advantages and disadvantages in handling baled wool. Much of the material in this report came from that survey.

Six firms presently baling wool in Indiana, Missouri, Colorado, Montana, Oregon, and California were interviewed. Trucking firms baling wool in Texas and New Mexico supplied additional information.

Additional factors, other than transportation, also need to be considered by wool warehouse operators in deciding whether to bale their wool. For example, proper evaluation of wage rates, labor efficiency and availability, volume handled, type and size of building, costs of machinery, and appearance and salability of the wool are necessary to determine the possibilities for baling.

BALING WOOL

The history of wool baling in this country falls into two broad periods.

Early Developments

From 1914 to 1917, some wools were baled at the Australian-type shearing sheds constructed at that time in Wyoming and Utah. The U. S. Department of Agriculture conducted baling experiments early in World War II to conserve the jute fabrics used in bags and utilize space in railroad

freight cars more fully. Several Portland, Ore., wool handlers have packaged their wool in bales for many years. Several million pounds of CCC wools were sorted and packaged in bales at Fort Worth, Tex., between 1947 and 1949.

Developments Since 1955

In 1955, a trucking firm in Texas started baling. Its primary motive was to reduce transportation costs. This firm designed a baling rig mounted on a truck trailer for movement to warehouses. There five or six bags of wool were compressed together into a bale and then loaded on trucks for shipment to eastern markets. Since that time another trucking company has set up baling facilities in San Antonio and San Angelo, Tex. This firm arranges to have wool brought to the baling facilities in bags where it is baled and then shipped to eastern markets via truck or water.

Most Texas and southeastern New Mexico wools are baled (five to six bags compressed together and bound with wires) and trucked.

The possibility of reducing freight, labor, and storage costs led wool marketing and handling firms in California, Colorado, and Missouri to begin baling graded wools in 1957. A firm with a warehouse in Billings, Mont., also started baling matchings (wool that is sorted after grading) in 1957. In 1958, a South Dakota firm compressed original bag wools by a modified "Texas system" for shipment by trucks. An Indiana wool marketing cooperative designed a baler and baled wool in 1959.

Dimensions and Weights of Wool Bales

Dimensions and weights of bales of domestic grease wool have not been standardized. Studies of the most efficient sizes and weights of bales have been conducted by wool marketing firms with primary consideration being given to costs and efficiency of available commercial baling machines. Diversity in sizes and weights of bales among firms are shown in table 1.

Table 1. - Average dimensions, weights, and densities of bales, 60's and finer shrinking 60 percent, and 50's-58's shrinking 50 percent

Firm	Dimensions	60's and finer shrinking 60 percent		50's-58's shrinking 50 percent		Wires per bale
		Weight	Pounds per cubic foot	Weight	Pounds per cubic foot	
	Inches	Pounds		Pounds		Number
A	52 x 27 x 39	750	24	650	21	5
B	48 x 24 x 36	675	28	575	24	5-7
C	48 x 24 x 36	650	27	550	23	7
D	60 x 22 x 30	600	26	525	23	3
E	61 x 31 x 35	750	20	550	14	6
F	58 x 29 x 48	975	22	875	19	6-8
G	62 x 28 x 42	950	23	850	20	9

Three firms included in the study used wires made up with hooks and eyes, and thus their bales varied little in dimensions. The other firms used wires with an eye only. Their bales varied 6 to 8 or more inches in the last dimension shown in table 1.

Two South Dakota firms not included in the survey compressed 4 bags to the bale, averaging 7 feet by 30 inches by 36 inches, and weighing approximately 1,100 pounds.

By comparison, foreign wools produced in the major exporting nations are packaged in bales as shown in table 2.

Table 2. - Average weights and dimensions of bales of some foreign wools 1/

Country	Dimensions	Average weight	Average density
	Feet	Pounds	Pounds per cu. ft.
Argentina	5 x 3 x 2.5	1,000	27
Australia	3 x 2.5 x 2.5	300	16
New Zealand	4 x 2.5 x 2.5	330	13
South Africa	3 x 3 x 3	315	12
Uruguay	5 x 3 x 2.5	1,050	28

1/ Dimensions from page 388, American Wool Handbook. Weights as reported by the Foreign Agricultural Service, U. S. Department of Agriculture.

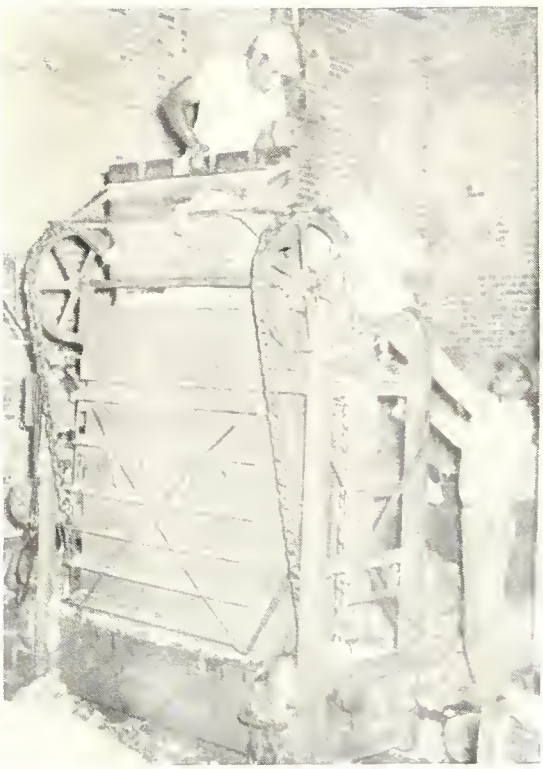
Most Australian, New Zealand, and South African bales are "dumped" (compressed to about one-half of their original size) for overseas shipment.

South American wool bales are made up in central market warehouses, while Dominion growers pack their wools in bales at the shearing sheds. However, many of the smaller Australian and New Zealand clips and offs are sorted and repacked in bales at terminal market warehouses.

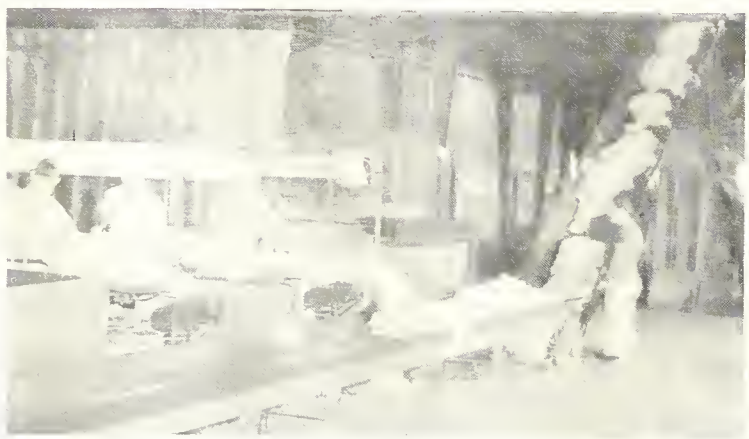
Bale Covers

Covers are made of jute fabric. Two firms studied used covers made of new burlap, while the others utilized used wool bags. One firm placed the wires directly on the wool and used an envelope-type bale cover, while the others placed wires on the outside of the cover.

Methods of Feeding Wool Balers



Hand feeding a portable baler.



Feeding sorted wool to a stationary baler with a belt conveyor. The fleeces are sorted on conveyors at the left with main sort going directly to the baler.

Feeding fleeces to a portable baler by a conveyor.

Feeding a Texas bag into machine for compressing bags into bales.

Only one firm did not cover the wool entirely. It had been this firm's experience that some buyers liked to inspect the uncovered wool, and this also saved covering material.

Machinery and Methods

Baling machinery and handling methods were not standardized, as shown in table 3.

Table 3. - Type, estimated cost, and weight of wool balers, by firm, 1959

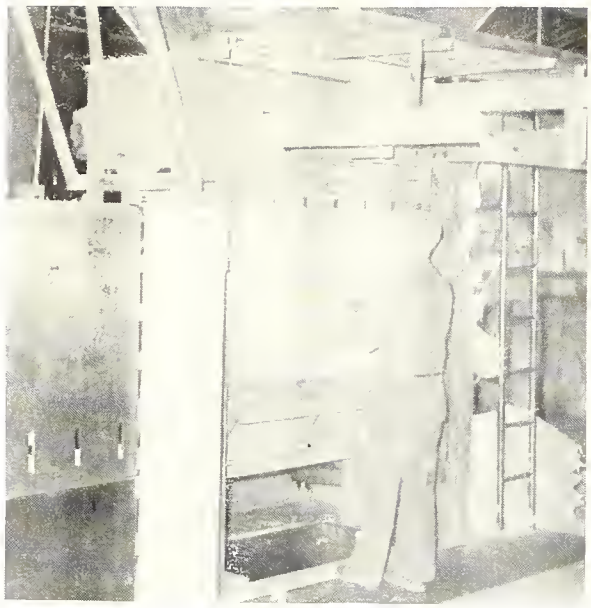
Firm	Type of baler	Approximate weight	Estimated cost of new baler
		Pounds	
A	Portable	6,000	$5,500
B	Portable	3,300	2,500
C	Portable	3,300	2,500
D	Portable	4,500	5,600
E	Stationary	-	-
F	Stationary	-	5,000
G	Stationary	3,300	2,500

One firm used an old double-box stationary cotton press and moved the wool from graded piles to the baler with a modified clamp lift truck.

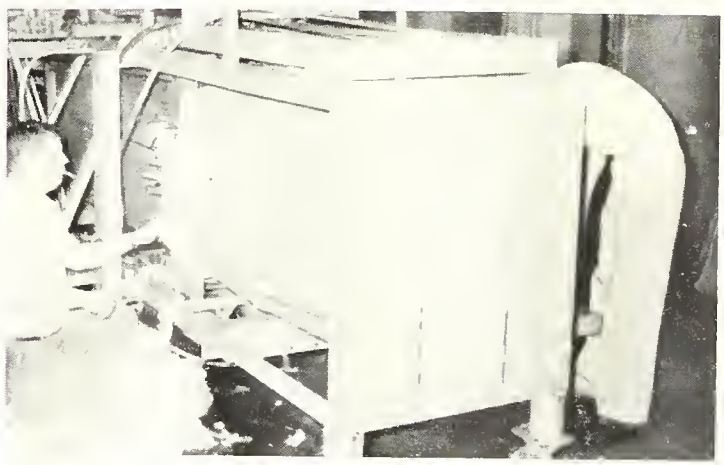
Another firm that baled sorted wool used a modern pit-type baler. It sorted the wool on conveyors and moved it directly to the baler on an endless belt. A firm in Texas used a comparable arrangement for sorting on belts but had a double-box cotton press. Two men could easily keep these balers going.

Several stationary balers were operating in Texas and New Mexico to compress bags into bales. The South Dakota firms used a specially designed baler for compressing four territory size bags into each bale. These bales were bound with 13 wires.

Four firms covered in the survey pushed portable balers from pile to pile of graded wool and then threw or conveyed the fleeces into the baler chamber. Two of these firms used 3,300-pound, $2,500 portable balers and threw fleeces into the chamber. One of these four firms used a



Tying a bale of sorted wool in a stationary baler.



Tying a bale of fleeces in a horizontal portable baler.

Tying Out and Removing from Balers

Removing a bale of fleeces from a portable vertical baler.

newly designed portable horizontal hydraulic baler. Another used a portable vertical hydraulic baler. The hydraulic cylinder type balers weighed 6,000 pounds and 4,500 pounds and cost about $5,500 and $5,600 respectively. Crews on the portable balers ranged from a low of two to a high of five men.

Man-hour requirements for baling 1,000 pounds of grease wool varied from a low of 0.4 to a high of over 1. In general, the conveyor - baler system for sorted wool required the least man-hours, and portable balers for baling graded fleeces required the most.

Clamp or fork lift trucks were generally used for moving, tiering, and loading out bales. However, most of the bales included in this study could be moved by hand trucks.

The study indicated that it would be desirable to have domestic wool bales standardized in size. Engineering studies are needed to determine the best bale size.

TRANSPORTATION SERVICES AND CHARGES

The type of transportation used for shipping baled wool varies somewhat from firm to firm. Railroads charge lower rates, in general, for long-haul shipments of wool in bags. However, truck and steamship companies are able to compete more strongly for hauling baled wool.

Baled wool, because of greater density, offers better payload possibilities for truckers. Consequently lower truck rates on baled wool have made trucks competitive with railroads for this traffic.

The high density of baled wool has also encouraged steamship companies to bid at competitive rates for intercoastal movement of wool.

As the result of competition from trucks and water carriers on baled wool, railroads have lowered rates for increased minimum weights between many points in the United States.

Size of Load by Type of Hauling Equipment

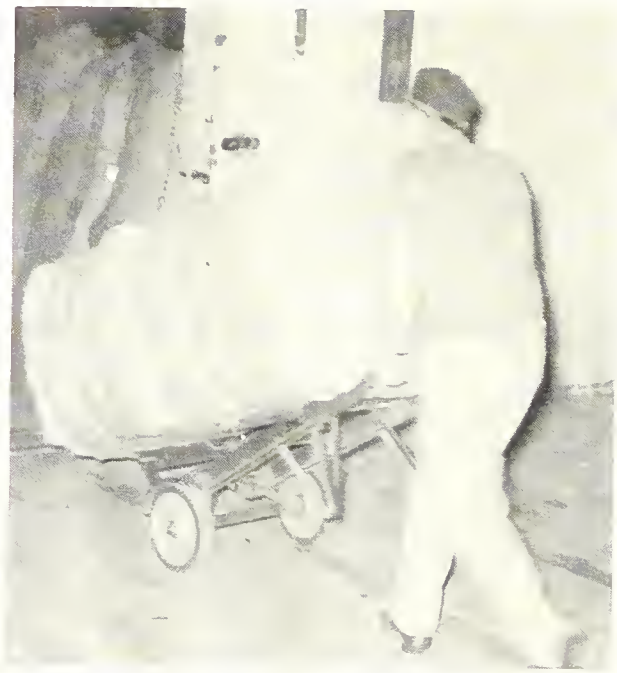
The amount of wool that can be loaded into transportation equipment depends on the size of the vehicle and the weight, dimensions, and density of bags or bales. Table 4 shows the maximum number of bales or bags of wool loaded in rail boxcars or truck trailers as reported by 4 firms.

At present, shippers seldom load rail cars to full capacity with baled wool as there is no rate incentive to do so. One exception is shipments originating in Texas or New Mexico where lower 60,000-pound minimum rates are available. However, very little baled wool is shipped out of Texas by rail.

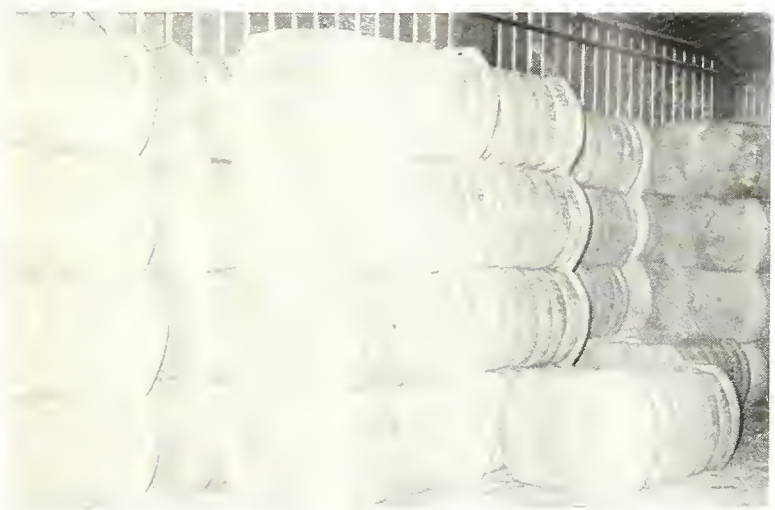
In general, over 60,000 pounds of baled grease wool can be loaded in a 40-foot boxcar and over 80,000 pounds in a 50-foot car. However, present

Moving a bale of wool with a fork lift truck.

Handling, Storing and Shipping



Hand trucking a bale of wool.



A few stacks of baled wool.

End view of bales of wool in a trailer.

loads average much lower than this. Shippers load most of their rail shipments to take advantage of the 40,000-pound minimum rate.

The maximum payload for tractor-semitrailer trucks varies from 30,000 to 36,000 pounds, depending on the type of truck and State motor vehicle size and weight limitations.

Table 4. - Maximum number of bales or bags of wool loaded in various size rail boxcars and trucks, as reported by 4 firms, on the average, for territory wools

Package		Rail Boxcar		Truck trailer
Type	Size	50-foot	40-foot	40-foot
	Inches		Number	
Bale	58 x 29 x 48	88	-	48
Bale	52 x 27 x 39	-	108	-
Bale	61 x 31 x 35	119	96	-
Bale	60 x 22 x 30	150	120	60
Bags	Territory	175	145	120 1/

1/ Open-top trailer.

Comparative Freight Rates and Services

Comparisons of freight rates charged by rail, truck, and water carriers are shown in table 5.

It is difficult to obtain the actual freight rates applying on wool transported by truck. Wool, as an agricultural commodity, comes under the partial exemption in Section 203 (b)(6) of the Interstate Commerce Act. Administrative Rulings No. 107 and 110 issued by the Interstate Commerce Commission list what the Commission considers to be exempt or non-exempt agricultural commodities.

Ruling 110 in its listing of exempt agricultural commodities includes: "Wool, raw, cleaned or scoured, but not including wool imported from any foreign country." Wool as defined in this Administrative Ruling can, therefore, be hauled by any trucker in interstate commerce and not be subject to economic regulation by the ICC.

Truck rates on wool published by regulated carriers and on file with the ICC are not necessarily the rates under which wool moves. Truck rates

shown in table 5 have been applied on actual wool movements between the points designated.

Table 5. - Comparative rail, truck, and water rates and charges* on wool from selected origins to Boston, Mass., and Charleston, S. C., June 1959

From	To					
	Boston, Mass.			Charleston, S. C.		
	Rail	Truck	Water	Rail	Truck	Water
	40,000-lb. min.	in bales	22 lbs. cu. ft.	40,000-lb. min.	in bales	22 lbs. cu. ft.
	Cents per 100 pounds					
Billings, Mont.	241	225	-	241	225	-
Denver, Colo.	214	190	-	209	170	-
Indianapolis, Ind.	119	-	-	141	-	-
Kansas City, Kans.	162	-	-	154	-	-
Portland, Ore.	247	-	194 3/	247	-	194 3/
Roswell, N. M.	214 1/	233 2/	233 4/	233	220 2/	220 4/
San Angelo, Tex.	212 1/	225 2/	225 4/	203	179 2/	179 4/
Stockton, Calif.	247	300	186 3/	247	235	186 3/

1/ 60,000-pound minimum weight.

2/ Includes charges of transporting from warehouse to baling facility, baling wool, and transportation to market.

3/ Includes wharfage, trucking from nearby warehouse to dock, and water transportation to East Coast dock.

4/ Includes delivery to customer's mill or warehouse.

* Applied on actual shipments between the points shown.

During the interviews representatives of the wool firms compared the services offered by different carriers. The responses included these:

1. Trucks are faster.
2. Trucks will deliver to from three to five mills or warehouses in a market area on one trip with little extra time required and no additional charges.

3. It is sometimes difficult to obtain rail cars of specified size.
4. Railroad transit privileges are worthwhile for some warehouse operators.

Effects of Baling on Rail Freight Rates

The effects of baling on rail freight rates have been significant. During 1958 and early 1959, railroads reduced freight rates on wool for heavier loadings. Minimum carload weights were increased to 40,000 pounds in the official freight rate territory; and, in the Southwest, to 60,000 pounds. For the rest of the country, the 40,000-pound minimum rates prescribed by the Interstate Commerce Commission in "Wool and Mohair Rates, Docket No. 28863" became usable.

Competitive factors, brought about by baling, were primarily responsible for these reductions. As mentioned previously in this report, trucks and steamship companies bid for baled wool traffic at rates lower than those charged by the railroads. Railroads attempted to regain lost traffic and retain the traffic they had by reducing rates in and between specific freight rate territories.

Table 6 shows rail freight rate reductions from selected origins to principal markets before and after 1958-59 rate reductions. Still lower rates based on 60,000-pound minimums are now available from specified points in Texas and New Mexico.

Several railroads in southern and official territories are considering establishing lower incentive rates on wool for heavier car loadings. This will make baling even more attractive to shippers as it will make it easier for them to take advantage of the lower incentive rates.

OTHER FACTORS

Wool warehouse operators in producing areas need additional information other than that on transportation to aid them in deciding whether to bale. This section includes a limited amount of such information obtained in the field and from published sources.

Core Sampling

Core sampling baled wools presents no particularly difficult problems according to personnel of the USDA Wool Standards Laboratory and those interviewed in this survey. Furthermore, there are good indications that, for core sampling, bales are superior to bags because smaller but better cores can be drawn.

Hook sampling for length and fineness distribution analyses is more difficult for bales than for bags.

Moisture and Tags

Moisture and tag content of grease wool pose no additional problems for baling as compared to bagging, according to those included in this survey.

Table 6. - Comparative rail freight rates on wool from selected origins to Charleston, Jamestown, and Johnsonville, S. C., and Boston, Mass., before and after 1958-59 freight rate reductions

From	To									
	Charleston, Jamestown, and Johnsonville, S. C.					Boston, Mass.				
	30,000 lb. Min.		40,000 lb. Min.		60,000 lb. Min.	30,000 lb. Min.		40,000 lb. Min.		60,000 lb. Min.
	Before	After	Before	After	After	Before	After	Before	After	After
	Cents per 100 pounds									
Artesia, N. Mex.	340	256	310	233	214	356	261	325	238	219
Billings, Mont.	347	261	316	238	-	362	265	329	241	-
Denver, Colo.	304	229	277	209	-	318	233	292	214	-
Indianapolis, Ind.	1/	166	1/	141 2/	-	203 3/	203 3/	165	119	-
Kansas City, Mo.	227	170	205	154	-	242	177	221	162	-
Portland, Ore.	361	271	328	247	-	371	271	337	247	-
San Angelo, Tex.	301	221	277	203	186	344	240	315	230	212
Stockton, Calif.	361	271	328	247	-	371	271	337	247	-

1/ No commodity rates available before August 1958.

2/ Rate applies on 50,000 pound minimum weight. Not applicable to Charleston.

3/ Rate applies on 24,000 pound minimum weight.

Appearance

The appearance of wool packaged in bales is somewhat less attractive than if packed in bags unless the fleeces are allowed to fluff out. The time required for fluffing out varies with the type of wool and the temperature -- being fast in hot weather and slow in cold. This presents a problem in showing and appraising baled wool. However, under some conditions, this problem may be solved by showing and appraising before baling or by controlling temperature and time so that the wool will fluff out.

One firm indicated that buyers have been able to adjust their appraisals on baled wool so they are as accurate as for bagged wool. However, baled wool was easy to show simply by "splitting" the bales lengthwise and "laying out" the two halves on the show floor.

Customers' Attitudes

Manufacturers' and topmakers' attitudes on baled wool, as reported by those interviewed, were uniformly favorable except for one mill's complaint that it took too long for baled wools to warm up for sorting during cold weather.

On the other hand, manufacturers and topmakers had few objections to bagged wool except for the extra handling and storage space required as compared to baled wool.

Costs

While no detailed study of comparative costs was made in this study, respondents gave their views on cost advantages of wool baling over bagging based on their own operating experience. Following are some of their opinions:

> "Approximately twice as much baled wool can be stored in a given warehouse space."
>
> "Accounting is simplified because one bale usually weighs as much as several bags."
>
> "Much less labor is required for in-warehouse handling and loading on trucks or railroad cars."
>
> "Core sampling is more satisfactory because a smaller core is needed."

Machinery costs for balers and fork lift trucks are significant and much higher than if, for example, only manual labor methods are used for bagging and handling. These machinery expenses are offset by reduced labor costs. One firm is considering using a clamp lift truck to cut down labor expenses even if all its wool is packaged in bags.