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COSTS OF MARKETING CATTLE IN UTAH

by

Eugene S. Sanford

A thesis submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF SCIENCE

in

Agricultural Economics

UTAH STATE AGRICULTURAL COLLEGE

Logan, Utah

1952

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INTRODUCTION

Need for cost data

In 1951 the cattlemen of Utah produced 126 million pounds of beef (2). Very few of these cattlemen knew what their marketing costs were and what their marketing costs would have been if they had chosen some alternative method of marketing their cattle. The knowledge of what marketing costs are should be as essential to the individual cattlemen as his ability to feed, fatten, and care for his cattle. The marketing costs in the cattle industry in Utah are not generally known because they have not been compiled and made available to cattle producers. In this study the marketing costs of the Utah cattle industry have been compiled, evaluated, and put into such a form that they might be used by the cattlemen of Utah if they so desire.

The major emphasis in this cost of marketing study has been placed on the intangible cost of marketing cattle--the loss of weight in transit rather than on the so-called cash costs of marketing cattle. The usual procedure in a cost of marketing study is to total the cash costs of marketing specified lots of cattle from various places to specified markets and to determine the marketing costs per hundred weight. These cash costs are easily determined and are usually understood without difficulty by cattlemen. The cash costs are presented in this study, but they are preceded by a discussion of shrinkage in transit so that the Utah cattleman will be able to apply a knowledge of the intangible to the tangible costs of marketing in making his cattle marketing decisions.

Three major problems relative to the cost of marketing cattle were considered. These were: (1) weight losses and associated causes; (2) transportation costs; and (3) selling and other costs. These three major problems are treated in individual sections in this study. These sections are followed by an example of how knowledge of the three may be applied in the making of a cattle marketing decision.

The data set forth herein were obtained as part of the study, "Costs of Marketing Livestock in the Western States," being conducted by the Western Livestock Marketing Research Technical Committee, United States Department of Agriculture, Bureau of Agricultural Economics, in cooperation with the Agricultural Experiment Stations of the western states. This particular study was conducted at the Utah Agricultural College Experiment Station and constituted a part of the Utah phase of the project for the year 1951. This study is a progress report on the Cost of Marketing study in the western states, and its findings must be regarded as preliminary and are by no means final and conclusive. Many gaps exist that must be filled before a completed study can be published. This study can serve as a guide for further research on the costs of marketing cattle in the western United States particularly in respect to weight losses in transit.

OBJECTIVES OF THE STUDY

The overall objective in this study was to determine the costs of marketing cattle in Utah. To do this it was necessary to (1) compile, tabulate, and evaluate the "out-of-pocket" costs of marketing cattle in Utah; and (2) compile, tabulate, and evaluate the various shrinkages occurring in various classes of cattle moving through the usual marketing channels in Utah. The analysis of shrinkage necessitated the determining of the effect of the following factors on shrinkage:

(a) Time
(b) Kind and age of cattle
(c) Nature of the fill and the amount of the fill before shipping
(d) Weather conditions and season of the year
(e) Fillback before sale
(f) Preshipping and after unloading conditions and treatment.

REVIEW OF LITERATURE

This review of literature will discuss the material which the author feels has made a contribution of useable knowledge to a study of this type. Literature on the cash cost of marketing cattle is fairly voluminous. In contrast with the literature on the cash costs of marketing cattle, literature on the intangible cost (shrinkage) is extremely limited. Numerous small studies on cattle shrinkage have been made from time to time by various experiment stations and state colleges. These studies are extremely limited in scope and are usually recitations of what happened to a particular lot of cattle on a particular cattle run. Most cost of marketing studies have a case history or two of this type included in their study along with their analysis of cash costs.

Two major studies of cattle shrinkage in transit have been published in the United States. Both studies dealt with selected groups of cattle. The first study made and published in the United States was that of W. F. Ward and James E. Downing (9) of the Bureau of Animal Industry in 1913. This study was entitled "Shrinkage of Weight of Beef Cattle in Transit" and dealt principally with the net shrinkage of range cattle. This study was published as USDA Farmers Bulletin No. 25. The 1913 study on the shrinkage of beef cattle in transit is valuable because it represented a period of three years' work on cattle shrinkage under varying conditions. The data on 18,000 head of cattle were analysed and included information on feedlot cattle in

addition to that on range cattle. The study was on a net shrinkage basis and included information on the fill at the market. This enabled the author to check his findings with those of the 1913 study where comparable groups of cattle could be compared. The conclusions of this study are presented in the appendix.

The 1913 study made some pertinent observations regarding specific feed conditions. That study referred to corn silage fills as having a heavy off-car shrinkage but that the fillback in the sale yards was good and that those cattle would, after a fill consideration, show about the same net shrinkage as grain fed cattle which had not been fed silage. Cattle which had been fed beet pulp showed a heavier net shrinkage. The shrinkage variable was discussed from the standpoint of the character of the season. Cattle which had been in drought areas shrank less than animals which had been on nutritious feed. Some calf examples were found where the animals gained weight over their loading weight after they had been allowed access to feed and water.

The second major study published in the United States was that of Paul L. Fletcher in his "Costs of Marketing Virginia Livestock" published in 1933 (4). Mr. Fletcher included a section on the shrinkage of 55 loads of heavy grass fattened cattle from Southwest Virginia to Jersey City in 1929. This study also used a net shrinkage figure and considered fill at the market. Fletcher made an observation regarding temperature to the effect that shrinkage costs (or losses) for the cattle marketed during cold weather were larger than those marketed during hot weather. The 1,500 pound steers showed a net average fill of about 20 pounds more per head at 80° F. than at

30° F. Another observation was that grass cattle did not take readily to dry feed after being on succulent grass. These cattle took on as much fill the first eight hours in the sale yard as they did after 30 hours in the sale yard, indicating that the fill that grass cattle took on was largely water.

A controlled study of a limited nature was one made by G. R. Abbenhaus and R. C. Penny of the Chicago Union Stock Yard and Transit Company (1). This study concerned the "Shrink Characteristics of Fat Cattle Transported by Truck" and consisted of 75 fat cattle transported by truck. The truck was equipped with scales, and 20 different lots of cattle were weighed every 25 miles. This is the most controlled experiment that has been made on cattle shrinkage in the United States but is extremely limited in scope. This study showed a high percentage of the shrink takes place the first few miles in transit, and interpolated to a time basis shows about 4 percent shrink for the first four hours in transit. The summary and three of the most pertinent tables of this study are included in the appendix.

Cost information as applying to Utah conditions was available from USDA feed schedules, yard charges, rail and truck charges, shippers manuals, and auction companies and are treated in their separate sections and in the appendix. These are public information and are not reviewed here.

SOURCES OF DATA

The data used in this study were obtained from both primary and secondary sources. The principal primary sources were: (1) individual case histories of actual cattle shipments, and (2) general surveys of cattle shippers' experience between specific points with specified classes and grades of cattle. The schedule of the variable factors used and approved by the Western Livestock Marketing Research technical committee was used in the individual case histories (exhibit 1). The case histories were used as check against the general experience schedules, (exhibit 2). The general experience of the large cattle speculator and marketing agencies was thought to be of value since it is this experience that is used to make the business decisions of the cattle shipper. The use of specific cases as a check against general experience proved to be highly satisfactory as one gave validity to the other.

The secondary source material included rates and traveling time from transportation agencies, stockyard charges from tariff sheets, records of sales and stockyard agencies, records of cattle shippers, USDA feed requirements and charges, designated material from the California phase of the project, and data from the studies discussed in the Review of Literature.

SHRINKAGE

Cattle lose weight while in transit from the farm or ranch to the market. This weight loss is commonly referred to as "shrinkage." Shrinkage that is due to a loss in tissue weight is a type of marketing cost that directly affects the owner of the animal. This marketing cost has not usually been evaluated for the cattleman in cost of marketing studies because of the many variables associated with shrinkage, yet shrinkage can be and usually is one of the major costs of marketing.

Importance of Shrinkage

If the Utah cattleman, through an understanding of what shrinkage really is, could reduce this shrinkage by 1 percent, there would be an annual increase in his income of slightly less than one-half million dollars at today's cattle prices. This 1 percent reduction in shrinkage is thought to be both possible and feasible. The producer must understand that some of the weight lost in transit to the market can be saved. Most excessive shrinkages can be prevented through proper handling and feeding either in the feed lot, on the ranch, during the journey to market, or after arrival at the market.

Probable dressing yield is one of the important factors that must be taken into consideration when cattle are sold for slaughter. The carcass is the valuable part of the animal, and the higher the dressing yield the greater is the return to the producer. It is to the producer's advantage to understand the factors that make for shrinkage and how to prevent excess shrinkage. This report concerns shrinkage; what it

is, when it occurs, where it occurs, why it occurs, and what might be done to reduce it under our Utah conditions. Excessive shrinkage represents an economic loss that might well be reduced if shrinkage is properly understood.

Kinds of Shrinkage

Shrinkage is of two kinds, tissue shrinkage and excretory shrinkage. The tissue shrinkage is the result of a decrease in the carcass weight of the animal as compared with the loss of weight due to the elimination of excreta which does not change the weight of the carcass. Shrinkage when approached from the standpoint of excretory shrinkage may be extremely high due to feed, weather, water, and other conditions that existed prior to the beginning and during the animals' journey to market. Tissue shrinkage is the more accurate measurement of shrinkage and the most difficult to obtain. Accurate measurement of tissue shrinkage would require considerable refinement including the slaughter yields of the cattle in question.

Terms Used in Describing Shrinkage

For purposes of clarification a definition of terms is necessary before proceeding further in a discussion of shrinkage; terms used in this paper are:

Net shrinkage is the difference between the loading weight at the shipping point and the weight after being fed, watered, and rested at the destination.

Fillback is the weight gain made during the time the cattle are being fed, watered, and rested at the destination as compared with weight off car. The fillback is part of and must be considered in

the calculation of net shrinkage. In this study a fillback period of not less than 36 hours nor more than two days was used in calculating net shrinkage. Cattle after being hauled seem to require at least 36 hours to resume normal eating habits. The fillback is an important part of marketing operations.

Weight after fill is the weight after the cattle have been allowed to have access to feed, water, and rest. It is the weight after a fillback period. The weight after fill must be connected with a time element in shrinkage analysis.

Pencil shrinkage is the weight that is deducted with a pencil. It is weight that is deducted from the actual weight of the cattle by what is commonly known as giving a shrink.

Pay (net) weight is the weight that the buyer actually pays for. It is usually the weight after a pencil shrink or in the case of auctions it is the weight that the cattle weighed at the sale. It can be the weight after fill at the destination (sale weight) or the weight at the origin after being held off feed and water for a period of time.

Gross weight is the weight before pencil shrinkage. In some cases gross and pay weight are the same if there is no pencil shrinkage.

Unloading weight (off car /truck/weight) is the weight of the cattle after being unloaded and before they are rested and allowed access to feed and water.

In transit is the period of time between weighings and includes time standing after the initial disturbance as well as time spent on a method of transportation.

Ways of Measuring Shrinkage

The most practical shrinkage figure and the most understandable measurement from the cattleman's viewpoint is net shrinkage. Net shrinkage as defined is the difference between the loading weight at the shipping point and the weight after being fed, watered, and rested at destination. A 36 to 48 hour period is used to calculate fillback. A more accurate definition of the time interval was not available from the primary data. This period was considered necessary to allow the animal to resume normal eating habits after the journey and the disturbances encountered during the transit period. Net shrinkage is the figure that is significant to the cattle shipper because it is the actual shrinkage of the cattle as far as the shipper is concerned.

There are four different ways that a shrink percentage may be arrived at, and all four are considered and used at one time or another in the trading of cattle. These four methods may be applied to any one load of cattle if sufficient information is available. The bases used in the various calculations differ resulting in widely divergent shrinkages. An example of how the use of different bases affect shrink percentages is given in table 3.

The first method is net shrinkage which is a comparison between loading weight and weight after fillback. Method two is a comparison between pay weight and weight after fillback. Method three is a comparison between loading weight and weight off-car. Method four is a comparison between pay weight and weight off-car. Unless the basis of comparison is known and interpolated to a net shrinkage figure or to a figure based on pay weight, the discussion of shrinkage is without a common basis of understanding. All four methods of calculating

shrinkage are used in this paper.

Time element consideration

Time is the most easily measured of the factors associated with shrinkage in transit. It is not only the most easily measured but is the most important single factor related to shrinkage. Other factors such as feed, kind and type of cattle, treatment in transit, weather conditions, season, and fillback are important; but they are in the last analysis modifying factors of time. Time might be referred to as the least variable factor, the other factors showing more variation.

The relationship of time to shrinkage is expressed in tables 1 and 2. These tables express the relationship of shrinkage to time in both fat and feeder cattle. These data show that shrinkage increased at a decreasing rate as time increased. The problem, however, is to isolate the time element from the modifying and affecting factors which also affect shrinkage. Data on feedlot cattle were selected from which most variable factors (principally feed) had been removed. This was done by selecting lots of fed cattle that had not been fed the morning of shipment and were in transit varying periods of time. The cattle were weighed at the feedlot in the morning and were transported without fill to destination. These shipments are summarized in table 1.

The gross weight and the weight off-car were used to measure shrinkage in transit and do not represent a "net shrinkage" figure. Net shrinkage on similar examples are discussed in detail on pages to along with accompaning fillback considerations. The net shrinkage was not presented in table 1 because of lack of complete information in all lots of cattle. The general relationships still

hold true after the fillback consideration, but net shrinkage is a distinctly different figure than one based on gross and off-car weight. Table 1 is a clear example of shrinkage increasing at a decreasing rate. This is illustrated in figure 1. The first four hours in transit showed about a 4 percent shrink with the shrinkage decreasing from that point on; 4.8 percent at eight hours, 8½ percent at 24 hours, and about 9.5 percent at 72 hours for fat cattle. Individual lots naturally show considerable variation. This variation is recognized in the column on range of shrink percentages.

The most consistent thing about shrinkage is variation. This variation must be recognized in an analysis of the shrinkage problem. The problem of how to make allowances for variation has not been solved and is not solved in this paper. If large numbers of records are available, an accurate average shrinkage may be arrived at. Shrinkage tends to group itself around the average. An observation may be made regarding individual animals in that individuals do show considerable variation, but when large numbers of cattle are available, the individual variations tend to average themselves out. The California case history presented in the appendix is an example of how these individual variations are removed by large numbers of cattle.

An item of interest on table 1 is a comparison of the lots in the sub-table 1. These particular lots consisted of cattle which were weighed, then stood two hours and were then hauled for two hours. Visual inspection fails to show any significant difference in shrinkage between lots of this kind and lots that were in transit for four hours. They appear to be a little higher. This comparison may possibly confirm the observation of large shippers that cattle

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Table 1. Shrinkage of fat cattle as related to time in transit [1/]

No. of cattle	Kind	Average weight	Gross weight	Weight off (car) truck	Time in transit	Percentage shrink	Range	Number of observations
		Lbs.	Lbs.	Lbs.	Hours	Percent	Percent	No.
32	Strs	868	27,790	27,525	1	- 0.9	---	1
1471	Strs	1141	1,678,080	1,620,105	3	- 3.45	-1.71 to -5.29	39
1021	Strs	1070	1,093,577	1,051,410	4	- 3.86	-3.2 to -4.6	11
265	Strs	1133	277,955	264,320	6	- 4.8	-4.2 to -5.0	4
1726	Strs	1081	1,893,357	1,786,444	7 - 9	- 4.7	-3.65 to -6.0	22
111	Strs	1019	108,540	99,360	24	- 8.4	-8.12 to -8.60	3
36	Strs	1081	28,101	25,165	36	-10.5	---	1
583	Strs	1075	626,719	567,650	72	- 9.4	-8.47 to -11.78	9
59 [2/]	Strs	1178	69,305	66,715	3	3.7	---	1
198 [2/]	Strs	1138	228,690	219,420	4	4.2	-3.8 to -4.59	6
60 [2/]	Strs	1119	67,125	64,020	6	4.6	---	1

1. Cattle shipped without access to feed the morning of shipment. Gross and off car weights used as basis of calculation.

2. Time in transit included time standing in corrals after being weighed.

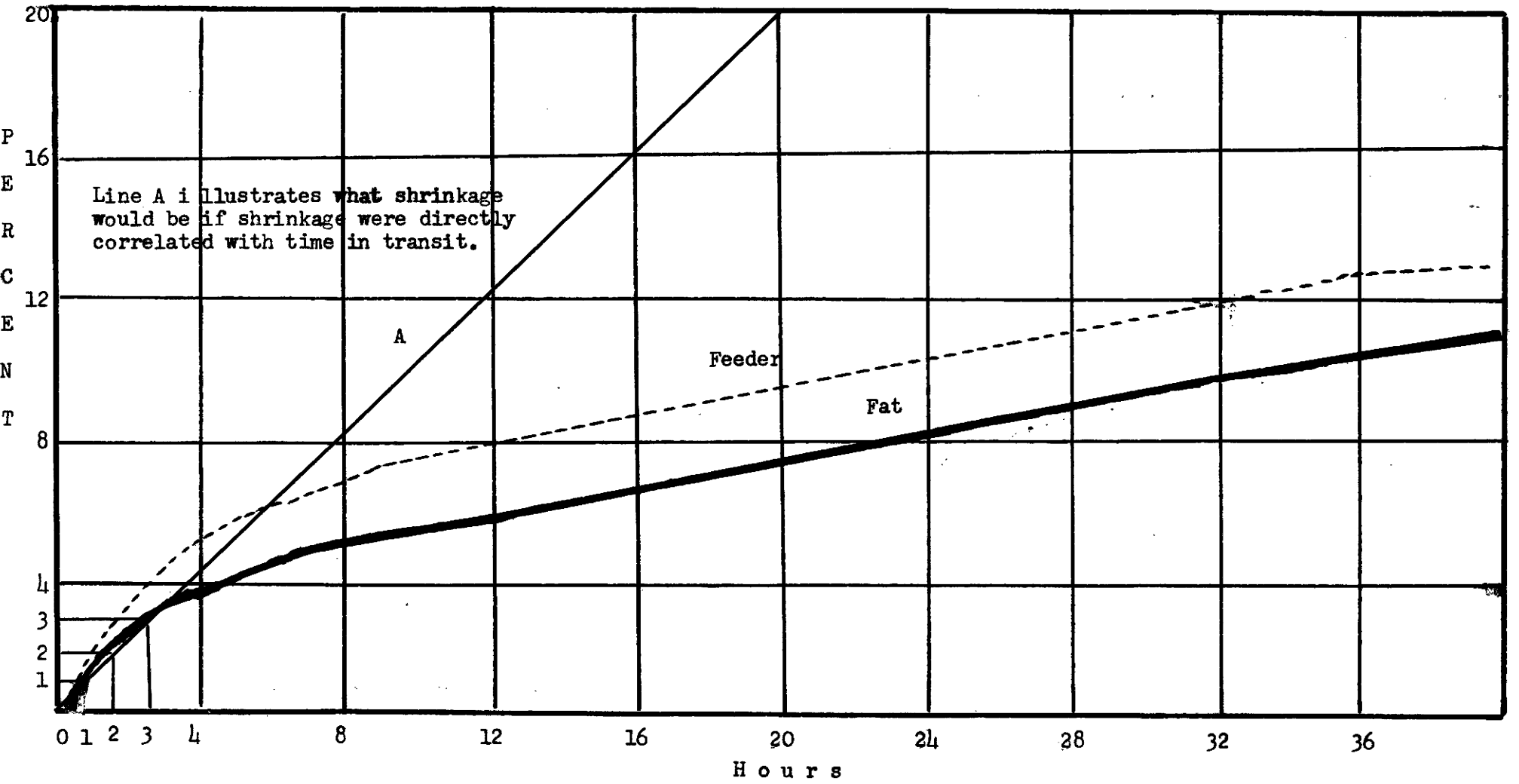


Figure 1. Total percent shrinkage of feeder and fat cattle as related to time in transit with fill consideration removed (based on gross weight and off-car weight).

shrank as much and possibly more standing in a strange corral than while being transported.

The 1 percent per hour shrinkage for the first four hours confirms a "rule of thumb" on cattle shrinkage which was reported by livestock dealers contacted during the survey. Livestock dealers experienced shrinkage in the case of fat cattle at the rate of 1 percent per hour for the first three to four hours in transit or after having been disturbed and one-fourth to one-half percent per hour for the next two or three hours provided the animals do not have an excessive fill the morning of the move. These same shippers stated that it made little difference on the first move from a standpoint of shrinkage whether the animals were in transit or standing in a strange corral after being disturbed.

The cattle in table 1 came from varying feedlot conditions including wet beet pulp and corn silage; but with an overnight stand in their home corral with access to water, the cattle on differing feed conditions had practically identical shrinkages. The qualification being that the cattle were weighed under a condition where there was no or very little fill at time of weighing.

The 583 steers which were in transit 72 hours had access to feed and water for a 12 hour period after the first 36 hours in transit so had some opportunity to regain weight, but showed 1 percent more shrink off-car than the cattle on a 24 hour run. Time was the element for consideration in table 1 and also in table 2 as the cattle in both tables were transported by both rail and truck.

The feeder cattle in table 2 also show increasing shrinkage at a decreasing rate as time increased. These cattle were weighed

Table 2. Shrinkage of feeder cattle as related to time in transit. 1/

No. of cattle	Kind	Average weight	Gross weight	Weight off (car) truck	Time in transit	Percentage shrink	Range	Number of observations
		Lbs.	Lbs.	Lbs.	Hours	Percent	Percent	No.
114	Strs	866	98,680	95,940	1	- 2.8	---	
585	Strs	844	494,757	477,320	3	- 3.5	-2.25 to -7.88	
120	Strs	1094	131,330	126,545	4	- 3.6	---	
277	Strs	1011	280,254	265,556	5 - 6	- 5.2	-3.5 to -8.2	
789	Strs	963	758,150	705,033	8	- 7.0	-5.75 to -8.18	
1976	Strs & hfrs	830	1,635,174	1,498,186	20	- 8.4	-4.8 to -11.6	
4019	Strs & hfrs	798	3,208,811	2,875,476	24	-10.4	-8.1 to -12.53	
2400	Strs	670	1,608,247	1,404,965	48	-12.6	-8.4 to -13.3	
336	Strs & hfrs	1038	348,971	301,754	72	-13.5	---	

1. Shipped without access to feed the morning of shipment (gross and off-car weights used as basis of calculation).

and loaded under country conditions which included dry range and all other types of pasture. A greater variation between individual lots of cattle would be expected than with the fat cattle. Feeder cattle show about the same general shrinkage for the first four hours as do fat cattle. In the shipments reported the livestock were generally comparable so far as fill considerations were concerned. The data also included some cattle which had been driven a mile or two prior to weighing. An attempt was made to eliminate some of the fill considerations that are so notorious in the cattle industry to measure and evaluate the time element in the case of feeder cattle.

Shrinkage of feeder cattle computed on the gross and off-car basis is higher than shrinkage of fat cattle by 2 or 3 percent for the longer periods of time. For both kinds of cattle approximately two-thirds of the shrinkage on a long time haul of 48 to 72 hours occurs between the first eight to 16 hours, most of it the first eight hours. Five-sixths of the total shrinkage on the long time haul occurs during the first 24 to 36 hour period with the remainder occurring during the last part of the journey. Fillback considerations change the picture somewhat in both feeder and fat cattle. This is discussed on pages 23 to 42.

Figure 1 is a comparison of the total percent shrinkage of feeder and fat cattle as related to time in transit with feed consideration removed. This illustration shows that shrinkage does increase at a decreasing rate. If shrinkage increased at a constant rate as time increased, the shrinkage lines would follow line A.

The general conclusions on time are similar to those reproduced in the 1913 study of Ward and Downing (9). Their summary table in the

appendix is presented as supporting evidence to the conclusions reached in this study. Fillback considerations are also considered in their summary table. Some conditions are different (there was usually a drive consideration in the 1913 study), but some of the same general conclusions revealed in the analysis of tables 1 and 2 are verified in this previous study. Emphasis was placed on the time element rather than distance because frequently there was very little relationship between time and distance. The general conclusion was the less time in transit the lower the off-car shrinkage.

Shrinkage from the standpoint of time may be measured another way; not in terms of "net shrinkage" which has not been considered yet, but in carcass yield of the animal. A representative of one of the major packing companies recently made an observation on cattle, which were being fattened at a feedlot in Ogden, to the effect that the cattle which were killed at the local plant yielded 1 to 1½ percent higher than apparently comparable cattle from the same feedlot which were being shipped to the company's Los Angeles plant. The cattle going to the Los Angeles plant were in transit 28 hours as compared with the cattle killed locally being slaughtered within the hour. This shows that time in transit in addition to removing excretory shrinkage does affect the tissue shrinkage during the time in transit. An accurate measure of tissue shrink could only be achieved by comparing carcass weights of animals slaughtered at point of origin with animals at points of destination. Such a procedure was not possible in this study. There is ample evidence that shrinkage increases as time increases but at a decreasing rate, and a rough measure of this shrinkage can be determined for the information of the men in the industry who are selling

livestock and are interested in knowing the weight loss that they might expect for specified periods of time.

Kind of cattle

It is commonly supposed that there is a difference between fat and feeder shrinkage, in shrinkage between light and heavy cattle, and a difference between sexes. Apparently there is; but when the data are placed on a comparable basis where the principal excretory factors are removed, there is very little difference. Table 3 is an example of the similarity of fat and feeder shrinkage and illustrates fat and feeder shrinkage on a comparable basis. This was a case study but is representative of shrinkage which occurs in transit and after fillback considerations.

Table 3. Illustration of varying shrinkage percentages by the use of different bases for computation. (Cattle shipped over 600 miles)

						Methods of calculation			
						1	2	3	4
				Weight	Weight	% shrink	% shrink	% shrink	% shrink
		Gross	Pay	off-	after	net	pay	N.W.	P.W.
No.	Kind	weight	weight	car	fillback	weight	weight	oC	oC
		Lbs.	Lbs.	Lbs.	Lbs.	Percent	Percent	Percent	Percent
27	Fat	28475	27621	24980	26847	-5.71	-2.80	-12.27	-9.56
64	Fdr	64333	61760	56980	60864	-5.39	-1.45	-11.42	-7.73

NW = Net weight PW = Pay weight oC = Off-car

Source: Primary data from cattle shippers.

Both the fat and feeder cattle in this illustration exceeded 1,000 pounds per head and both had been shipped long distances. The information on fillback was available in both cases so a complete picture of fat and feeder comparisons might be made.

Inspection of tables 1 and 2 show that there is a distinct similarity in the shrinkage between fat and feeder cattle. Shrinkages were about the same on the short hauls (four to eight hours), but in the long hauls feeder off-car shrinkage was higher by 12 percent (table 4) than for fat cattle (table 1).

Table 4. Shrinkage of feeder cattle in transit as related to time and animal weight. (Gross and off-car weights used as basis of calculation)

No. of cattle	Kind	Gross weight	Off-car weight	Weight gain or loss	Average weight G.W.	Percentage shrink	Range	Time
		Lbs.	Lbs.	Lbs.	Lbs.	%	%	Hrs.
951	Strs	653,082	590,591	- 62,491	687	- 9.56	- 3.88 to -15.90	24-36
716	Strs	724,205	647,005	- 77,200	1011	-10.65	- 6.65 to -12.31	24-36
2672	Strs	1,802,308	1,580,120	-222,188	674	-12.32	- 5.22 to -12.64	48-88
336	Strs	348,971	301,754	- 43,217	1038	-13.53	---	72-88

Feeder cattle have a greater off-car shrinkage but also have a greater element of fillback, bringing the net shrinkage to a comparable figure. Livestock shippers commented that "fat animals usually are stiff and sore after being hauled and do not fill as readily as feeders". A California shipment of 954 feeder cattle, (see appendix) averaging 600 pounds and being taken from grass to grass and hauled 14.5 to 25 hours, shrunk 8.34 percent off truck and, after a 36 hour fillback period on grass, had a net shrinkage of 3.4 percent which would be practically identical with fat off-car shrinkages and net shrinkage for a similar period of time with the exception of the additional modifying factor that these feeders experienced some drive and stand considerations which

is fairly common in the case of feeder cattle.

The weight loss in transit of feeder cattle is shown in table 4. A visual inspection fails to disclose any major difference between cattle of various weight groups for comparable periods of time.

Few calf examples were available for consideration, but the examples that were obtained in this study showed that calf shrinkage is about the same percentage-wise as that existing in the older cattle. This shrinkage if anything may, in a good share of the cases, be slightly less than the shrinkage of the older cattle. The general experience surveys reported that usually it is impossible to fill a calf with high shrinkage feeds; the calf if just off his mother refuses to eat, thus failing to shrink excessively. One case history of 118 calves on a 5-day haul showed a shrinkage of 10.5 percent which is about that of other cattle under comparable conditions. Another case showed the calves holding their weight after being trucked and allowed a fill period. These particular calves had been on dry range, their mothers were giving little milk, and access to feed negated any shrinkage that might have occurred normally. The 1913 study (9) commented on this same feed condition and also confirmed this study's observation that calf shrinkage is proportionate to weight.

There is very little difference between sexes as far as shrinkage is concerned if fill considerations are removed. A comparison of gross shrinkage of feedlot steers, feedlot heifers, and slaughter cows for the same periods of time is shown in table 5. The slaughter cows came from dry range and hence were considered from a somewhat similar feed condition as the feedlot animals. The shrinkages for the various times involved were very similar. If feed considerations enter the picture,

then the cows, because of larger stomachs, lack of high finish, and possibly other factors, would show a higher shrinkage. This was recognized and an attempt, by the elimination of the fill condition, was made to obtain a more accurate picture of the situation.

Table 5. Comparison of gross shrinkage of fat cows, heifers, and steers[1/]

No. of cattle	Kind	Time in transit	Gross weight	Off-car weight	Percentage shrink	Range	Average weight
		Hrs.	Lbs.	Lbs.	Percent	Percent	Lbs.
640	Strs	3-5	692,993	665,575	4.0	3.6 - 4.5	1079
295	Hfrs	3-5	259,900	249,820	3.9	3.4 - 4.8	1098
326	Cows	3-5	371,230	354,167	4.5	3.0 - 6.4	1121
238	Strs	6	243,120	231,175	4.8	---	1052
288	Hfrs	6½	137,880	130,540	5.3	5.2 - 5.5	479
600	Strs	7-9	664,161	638,287	4.6	3.4 - 5.2	1107
238	Hfrs	7-9	209,035	197,635	5.4	---	878

1. These animals were not fed the morning prior to shipping.

On the 3-5 hour transit period, the heifer and steer shrinkages were practically identical, and the cow shrinkage was one-half percent higher. The heifer shrinkage was higher on the next two time periods, but the number of cattle involved was relatively small so this higher shrinkage may be due to chance. These general relationships were confirmed by the 1913 study (9).

The Nature of the Fill and the Amount of Fill Before and After Shipping

The nature of the fill and the amount of fill before shipping has

considerable to do with the amount of gross shrinkage occurring in transit. Tables 1 and 2 were illustrations of gross shrinkage with the fill considerations removed. Shrinkage of cattle in transit can be predicted when the time element is known if the cattle are not filled excessively before moving. When the cattle have some fill in them, the predicting of gross shrinkage on an off-car basis becomes more difficult. This is also true in the case of net shrinkage, but the variability is not as great. Table 6 is presented as an illustration of the way preshipping fill affects the gross shrinkage on an off-car basis. The data show there are no clearly measurable tendencies

Table 6. Examples of shrinkage when cattle are fed before being transported

No. of cattle	Kind	Weighing condition	Time in transit	Percentage shrink[1]	Usual shrinkage[2]	Comments
			Hrs.	Percent	Percent	
20	Fdr strs	County	2	- 8.9	- 2.8	Water fill
1896	Strs	Feedlot	3	- 5.5	- 3.6	Weighed previous day
74	Strs	Feedlot	6	- 8.8	- 4.5	Weighed previous day
392	Strs	Feedlot	7	-10.2	- 5.0	Weighed after feeding
50	Strs	Feedlot	8	-10.7	- 5.5	Weighed after feeding
11	Cows	Smotherweed pasture	8	-13.0	- 6.0	Artesian water, smotherweed pasture
150	Cows	Dry range	24	-10.7	- 9.0	Cows on frosted mountain pasture
179	Fdr strs	County	24-30	-15.7	-10.0	Water filled, thin cattle

1. Without fill consideration

2. An average approximation of cattle shrinkage when the animal does not have a fill consideration

from a standpoint of time as in the case of tables 1 and 2, and also show, in the first half of the table, that disturbances are an element that make for shrinkage. This is further support of the claim that a period of time standing in a strange corral or place will result in about the same shrinkage as that incurred in transit.

There are certain feeds that are always associated with excessive shrinkage. Livestock dealers in their buying activities attempt to eliminate this hazard by means of lower prices and favorable weighing conditions. Silage, beet pulp, frosted pastures and water, high quality alfalfa hay and warm artesian water, and some succulent grass conditions generally result in a shrinkage hazard in the buying and shipping of cattle.

Some specific examples of excessive fills are given in the following case histories and general experiences reported by cattle shippers. Cattle shipped from central Utah which have been on salt grass pastures will, on a net shrinkage basis, shrink another one-half percent more than cattle from the feedlot or from other types of feed. The cattle seem to take on an excessive water fill. Cattle from salt grass pastures characteristically shrink more than those from the feed lot. Dry salty feed and water make for excessive shrinkages.

An example of a water fill after being on frosted mountain pastures was the case study of five carloads of cows weighing 1,300 pounds who lost 150 pounds per head on a 20 hour haul. Had these cows stood over night, the unusual fill consideration would been eliminated to the point where the shrinkage would have been almost cut in half.

Two other reportedly high shrinkage conditions are beet top and green alfalfa shrinkages. These result from the high moisture content

of the fill. Cattle being fed on beet tops make good gains but should be put on dry feed to harden before shipping or handling. One of the major reasons for excessive net shrinkage is that cattle do not take readily to dry feed after being fed succulent feeds.

Silage fill examples are quite common in the industry. One example of excess fill and a shrinkage of 14 percent is the case of cattle which had been fed silage and were cut off silage three days prior to sale. The morning of the sale the cattle were fed all the silage they would eat. These cattle showed 14 percent shrinkage in less than a day's time standing in the yards after being weighed. They were hauled 3 miles, weighed at 10 a.m., stood and reweighed at 5 p.m. that afternoon.

Preshipping conditions are important in the shipping of cattle. The conclusion reached in this study from discussion with the men in the industry, from the general experience surveys and case history studies (some are discussed in the section on Transportation) is that fill before shipping leads to unnecessarily high gross and net shrinkage. Truck lines and railroads prefer to haul cattle that have not been filled excessively and feel that cattle which have been filled show an excessive shrinkage. Case histories and general experience surveys bear this out. The animal which is filled before being placed in transit has a full stomach and passes an excessive amount of excretory shrinkage. He is uncomfortable and becomes sick from jostling of other animals as well as from the movement of the truck. He loses weight from nervousness and sweating which are increased by excessive fill. In a case history, involving a truck load of cattle fed silage and grain in the morning prior to loading in central Utah for Los Angeles,

the buyer estimated at the time of loading that the cattle would shrink 1 percent or more above the area average of those shipped under normal conditions. These cattle after fillback in Los Angeles showed a net shrinkage of 5.75 percent as compared with an area average of 4.5 percent indicating that an excessive net shrinkage had been caused by the early morning fill.

The 1 percent loss in net shrinkage in the above case history could have been avoided by proper preparation for shipping. Truck lines feel that cattle which have not been fed excessively without deviation from the usual feeding procedure and are picked up from the home corral in the morning prior to feeding, will shrink less. Some have suggested that hay be placed in the managers over night but that no other preparation be made for the journey. The excess loss of weight is particularly avoidable if feeds like wet beet pulp and silage are not fed the morning of shipment.

Auction conditions represent a different situation as far as net shrinkage in transit is concerned. They not only represent a different type of weighing condition, but they also represent one that is highly variable. The hauling, jostling, and stand that takes place on the journey to the local auction ring is considered equivalent to a 3 percent shrinkage. This idea has some substantiation in table 7. Comparing the auction cattle with those purchased in the country shows about 3 percent difference. The yard-stand cattle also show a heavy shrinkage. More records on cattle purchased in auctions are needed before any definite conclusion can be reached as to the amount of shrinkage that usually takes place in the auction ring. The "rule of thumb" used by some cattle dealers who speculate with auction

Table 7. Shrinkage of feeder cattle at auction and country weighing points

No. of cattle	Kind	Origin	Gross weight	Off-car weight	Weight gain or loss	Average weight G.W.	Percent shrink-age	Time	Shrinkage range	No. lots
			Lbs.	Lbs.	Lbs.	Lbs.	Percent	Hrs.	Percent	
1667	Strs	Country	1,377,287	1,237,596	-139,691	826	-10.14	24-36	-3.88 to -15.9	12
134	Mixed	Auction	101,585	96,725	- 4,860	758	- 4.78	24-36	-2.52 to -5.3	5
3008	Strs	Country	2,151,279	1,881,874	269,405	715	-12.52	48-84	-5.22 to -14.24	8
352	Strs	Auction	319,730	290,730	29,000	908	- 9.07	72	-4.8 to -12.3	10
528	Strs & hfrs	Auction	392,274	371,560	20,714	743	- 5.28	Yard stand[1/]	0 to -11.7	21

1. The yard stand was up to 36 hours without feed and water.

cattle is 1 percent per hour gross shrinkage for the first three or four hours of moving, standing, and transporting with a decreased rate the next two or three hours. This standard is about the same as that seen in table 1.

Auction weighing conditions are highly variable and an allowance of 3 percent for the auction weighing condition requires considerable qualification. If cattle are filled, hauled a short distance, and sold upon unloading at the auction ring, then high shrinkages will be experienced by the purchaser, table 8.

Table 8. Shrinkage of fat cattle from feed lots and auctions

No. of cattle	Kind	Origin	Gross weight	Auction weight	Off-truck weight	Percentage shrink	Range
			Lbs.	Lbs.	Lbs.	Percent	Percent
838	Mixed	Feedlot[1/]	873,196		830,922	-4.84	-3.65 to -6.19
305	Mixed	Auction		306,345	289,375	-5.54	-4.46 to -6.43

1. The feedlot cattle were not fed the morning of shipment whereas the auction cattle had been allowed access to feed.

Feedlot cattle were taken directly out of the feedyard and weighed off-truck after six to nine hours in transit, while the auction cattle were purchased out of the ring and then hauled a comparable period of time. The feedlot cattle were all weighed out of the feedlot early in the morning without feed, whereas the cattle from the auction came from diverse feed conditions and had been allowed access to feed and water prior to sale.

Auction cattle originate from every conceivable feed condition, and secondary records frequently do not permit segregation of the cattle

as to feed conditions. An analysis of auction conditions must recognize this and allowance must be made for these extreme variations. Frequently auction cattle are lumped and the general averages are not always as representative of the particular class of cattle as they might be. A case study of auction conditions was made from the buying records and experience of two shippers of fat cattle from the Salina-Richfield auctions, table 9. These cattle were purchased from the same two auctions and were shipped by the same truck line to Los Angeles. The lots of cattle were mixed but consisted mostly of fat cows and represented diverse feed conditions but uniformity in handling.

Table 9. Shrinkages arranged according to magnitude for shippers from Richfield-Salina auctions to Los Angeles via truck

⁄1.132	- .957	-1.55	-1.856	-2.526
⁄ .801	- .972	-1.56	-1.867	-2.58
⁄ .761	-1.018	-1.57	-1.925	-2.675
⁄ .685	-1.111	-1.58	-2.183	-2.686
⁄ .575	-1.197	-1.66	-2.20	-2.9
- .408	-1.251	-1.668	-2.269	-3.17
- .656	-1.308	-1.743	-2.3	
- .677	-1.534	-1.745	-2.371	
- .733	-1.535	-1.819	-2.401	
- .942	-1.54	-1.842	-2.5	

Median = 1.575 percent

Mode = 1.8015 percent

Mean = 1.585 percent

Standard deviation = 1.0015 percent

They were sold in Los Angeles after being on feed and water one to two days after they were unloaded off trucks. The shippers experienced shrinkage (based on purchase weight and weight after fillback) of 1.59 percent. These cattle dealers estimated that the weighing

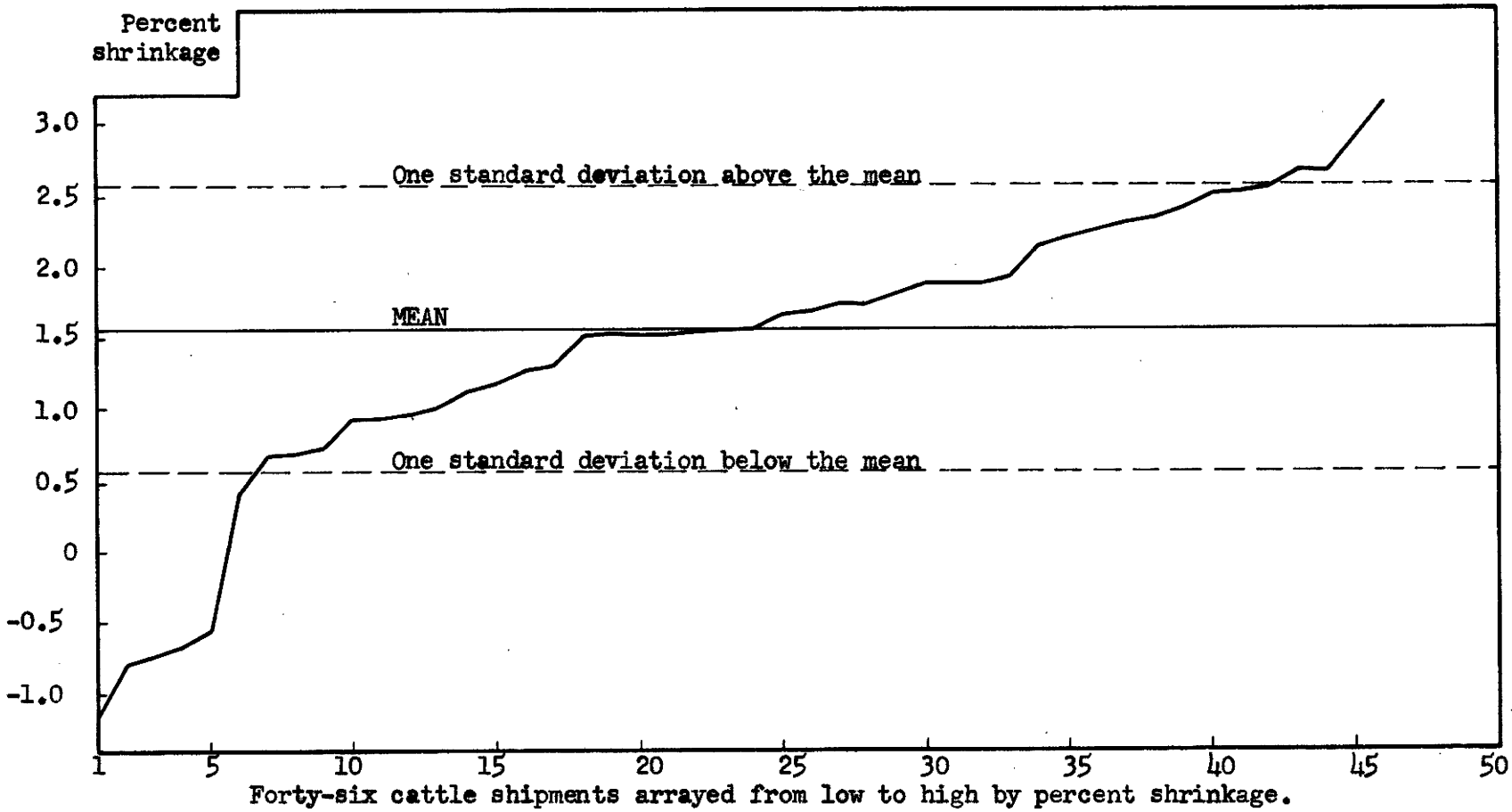


Figure 2. Shrinkage of 46 lots of cattle shipped from Richfield-Salina auctions to Los Angeles via truck.

conditions at the auction are ordinarily equivalent to a 3 percent pencil shrinkage. If this estimate is correct, then the net shrinkage on these cattle would be about 4½ percent. Fat cattle from central Utah consigned to Los Angeles with a slightly longer running time had in the case of 871 mixed cattle from comparable feed and other conditions a net shrinkage of 4.98 percent, table 10. The shipper of the 871 mixed cattle stated that these cattle would, with a 3 percent pencil

Table 10. Shipments of fat cattle from central Utah to Los Angeles by rail with running time from 24 to 30 hours (2 day fillback), all seasons

No. of cattle	Kind	Gross weight	Weight after fillback	Weight gain or loss	Average weight (L. W.)	Percentage shrink
		Lbs.	Lbs.	Lbs.	Lbs.	Percent
26 1/	Strs	28,448	27,460	- 988	1094	-3.4
36 1/	Strs	27,890	26,910	- 980	775	-3.5
871	Mixed	918,557	872,800	-45754	1053	-4.98
27	Strs	28,475	26,847	- 1628	1054	-5.71
960		1,003,370	954,017	-49353	1045	-4.91

1. These cattle were driven five miles before being weighed and so are on a slightly different basis from the other cattle in this table.

shrinkage, shrink about 4½ percent over purchase weight in Los Angeles. He did not buy on a straight 3 percent pencil shrinkage, but sometimes bought with a 2 percent pencil shrinkage because of competitive factors and tried to make adjustments on the price. The net shrinkage figures are comparable and give considerable validity to the assumption that auction conditions in this instance are equivalent to a 3 percent pencil shrinkage.

The mean net shrinkage of these cattle was 1.58 percent as compared with a median of 1.57 percent; the mean and the median being almost identical figures. The mode was 1.80 percent which was in line with estimates of shrinkage of 2 percent and which the dealers indicate they expected on this particular cattle run. The standard deviation is 1.0 percent which is an indication that even under conditions which are similar shrinkage is still subject to considerable variation.

Shippers stated that net shrinkage was less in the summer due to a larger fillback that takes place during warm weather. This observation was also made in the Fletcher study (4) of grass fat cattle. This study showed that 1500 pound steers showed a net average fill of about 20 pounds more per head at 80 degrees F. than at 30 degrees F. Cattle shippers were of the opinion that cattle showed a high excretory shrinkage during the first move in warm weather but that the fillback rate was high. The animals filled back more in the summer and filled to the point where net shrinkage was less in the summer than in the winter. The seasonal variation is analyzed in a separate section of this paper.

Shippers from central Utah estimated that they could ship their cattle to Los Angeles and after fillback experience a 2 percent or less shrinkage loss on the cattle which had been purchased in the local auction rings. The net shrinkage was usually less than 5 percent for cattle loaded at country points. One shipper stated that his cattle usually averaged 5 percent off-car shrinkage from auction purchase weight and filled back to a net shrinkage of 2 percent or less at Los Angeles. These figures are in line with the usual off-car

shrinkages of 8 percent from feedlots in Utah to the Los Angeles yards. Central Utah auction weighing conditions seem to be equivalent to about a 3 percent pencil shrinkage.

Auction conditions at the Ogden Auction are more variable. Cattle may be shipped long distances to Ogden and sold before a fill-back. Cattle of this type show a light net shrinkage. An example of this is table 11. This table contains cattle that were purchased at

Table 11. Shrinkage on shipments of fat cattle from the Ogden Auction to Los Angeles by rail traveling time of 28 hours

No. of cattle	Kind	Auction weight (P. W.)	Weight after fillback[1]	Weight gain or loss	Average weight (P. W.)	Percentage shrink	Date
		Lbs.	Lbs.	Lbs.	Lbs.	Percent	
90	Cows	93535	91860	-1675	1034	-1.79	12/22/50
27	Mixed	30780	29800	- 980	1140	-3.18	3/12/51
42	Cows	47430	47430	00	1129	00	3/14/51
26	Strs	26875	26665	- 210	1033	- .78	4/26/51
185	Mixed	198,620	195,755	-2865	1073	-1.442	

1. Two-day fillback.

the Ogden Auction and shipped to Los Angeles and allowed a two-day fillback period. The net shrinkage in these cases was 1.442 percent which is .1 percent less than cattle which had been purchased at central Utah auctions. Several factors might account for this lower net shrinkage. The cattle had either been transported considerable distances or had passed through another market on their journey to Ogden. These conditions take the heavy first shrinkage out of the cattle. The observations are too few for drawing definite conclusions.

Shrinkage of slaughter livestock purchased at the Ogden Auction (table 12) then shipped by rail to San Francisco was about the same as that observed in the discussion of table 7. The cattle are rested and fed prior to sale and sometimes prior to loading on cars and should be comparable to shipments from other auctions.

Table 12. A record of cattle purchased at Ogden Auction and shipped by rail to San Francisco, 1951. (Transit time 72 hours)

Number head	Purchase weight	Off-car weight	Weight shrinkage	Shrink per head	Average weight	Percentage shrink	Date
	Lbs.	Lbs.	Lbs.		Lbs.	Percent	
87	84,640	76,635	-8005	- 92	973	1/ 9.46	1-22
57	53,810	48,645	-5165	- 91	944	1/ 9.60	1-29
23	25,305	22,800	-2505	-109	1100	1/ 9.90	2-8
57	55,360	51,780	-3580	- 63	971	2/ 6.47	2-12
83	85,150	78,195	-6955	- 84	1026	8.17	2-21
88	88,325	82,045	-6280	- 71	1004	7.11	2-26
28	28,560	26,050	-2510	- 90	1020	8.79	3-14
29	29,710	27,895	-1815	- 63	1024	2/ 6.11	3-19
27	28,795	26,565	-2230	- 83	1066	7.74	3-21
47	49,660	46,035	-3625	- 77	1057	7.30	3-26
25	26,470	24,610	-1860	- 74	1059	7.03	4-5
35	36,480	33,085	-3395	- 97	1042	1/ 9.31	5-25
24	25,430	23,940	-1490	- 62	1060	2/ 5.86	8-16
26	27,145	24,630	-2515	- 97	1044	9.27	9-30
37	40,390	36,035	-4355	-118	1092	1/10.78	10-16
26	27,040	23,890	-3150	-121	1040	1/11.65	10-22
27	29,270	26,620	-2650	- 98	1084	1/ 9.05	10-23
60	37,200	32,380	-4820	- 80	620	1/12.95	10-16
27	30,220	27,135	-3085	-114	119	1/10.21	10-30
30	32,040	29,120	-2920	- 97	1068	1/ 9.11	11-12
51	55,355	49,880	-5475	-107	1085	1/ 9.89	11-18
25	28,165	25,780	-2385	- 95	1127	8.47	11-6
45	51,025	46,780	-4245	- 94	1134	8.32	11-12
25	27,935	25,935	-2000	- 80	1117	7.16	11-15
25	29,975	27,600	-2375	- 95	1199	7.92	11-20
49	53,110	48,580	-4530	- 92	1084	8.53	11-26
1063	1,086,565	992,645	93,920	2344	1022	8.69	1951

1. High shrinkage despite auction conditions that remove some fill. Evidently yard fills.

2. Apparently some shrinkage had occurred in the yard and in transit prior to sale.

Country weighing conditions are sometimes questionable. Lack of accuracy in scales, failure to have scales inspected periodically, and inadequate weighing facilities have considerable influence on the apparent nature of the fill and shrinkage in transit.

The after-shipping conditions while the animal is at the market are important in the influencing of the amount of fillback that cattle will take on at the market. Cattle are sometimes weak and sick after the journey. Fat cattle may be stiff and sore from the unusual amount of movement which they have been subjected to. Feeder cattle from poor feed may have been weak before beginning the journey. Men in the industry state the best practice is to allow the animal to rest as soon as possible after unloading. This is contrary to the usual yard practice which is to get them on hay and water as soon as possible. Cattle should be allowed to rest for two or three hours then fed a slight amount of hay. This should be followed by a rest period after which access to a small amount of water is the best procedure. After this has been done, cattle will usually lay down and rest. Free access to feed and water until time of sale can be allowed after the cattle are rested. This method will apparently induce cattle to resume their normal eating habits in the shortest possible time.

Weather conditions and season of the year

Weather conditions have a definite influence on shrinkage. Adverse weather conditions such as cold weather, rain, snow, and other conditions that make the animal uncomfortable affect the amount of fill the animal will take on. This failure to fill may take place either at the feedlot or at the market. Adverse weather conditions were frequently given on the general experience surveys as one of the causes of excessive net shrinkage when the animals failed to fill at

the market. The situation is different in warm weather when cattle take on a high first fill and have a high fillback at the market. The Fletcher study (4) made this same observation. Information on summer shipments was limited, but dealers stated that a decrease in net shrinkage was the usual situation. Some verification of the influence of weather (temperature) is found in table 13. This table is a case history example of two different lots of cattle from the same feedlot in different seasons.

Table 13. Illustration of differences in excretory shrinkage when compared with net shrinkage (fillback illustration) on different seasons, fat cattle 1/

No. of cattle	Kind	Loading weight	Weight off-car	Weight after fills	Percent shrink off-car weight	Percent shrink Net Wt.
		Lbs.	Lbs.	Lbs.	Percent	Percent
26	Strs	28,448	26,930	27,460	- 5.33	-3.4
36	Strs	27,890	24,410	26,910	-12.47	-3.5

1. These two loads of steers were from the same feedlot.

The first load averaged 1,094 pounds and the second load averaged 775 pounds and did not have the high degree of finish the first load had. The excretory shrinkage was extremely high in the case of the lighter cattle, but the fillback was also greater. Both loads were driven five miles to the scales at the railpoint and were 24 hours in transit by rail. In some element of shrinkage had already taken place. Two percent could be safely added to the net shrinkage figure to allow for shrinkage due to the drive. The first load of cattle was shipped in January and the second load was shipped in the latter part of June; an example of high shrinkage and the high fillback that occurs in warm weather.

The season of the year problem in respect to shrinkage may be approached from the standpoint of the usual seasons or from the character of the season.

When shrinkage differences are analyzed from the standpoint of the different seasons of the year, several problems occur. A major consideration is the fact that different classes and kinds of cattle are marketed at different seasons. Fed animals are marketed during all seasons but here the temperature on the day of sale may overshadow the seasonal variation. The 1913 study (9) observed that a difference existed from year to year during the same season.

A conclusion based on statements given by a survey of dealers regarding weather and seasonal variation might well be that cattle lose less in the first move during cold weather and they also fill back less than cattle that are moved in warm weather. Cattle lose more weight during the first move in warm weather and gain back more in warm weather than cattle moved in cold weather. The fillback of the cattle is proportionately enough higher in warm weather that the net shrinkage is usually less during the warmer months.

Case study of cattle from the same feedyard shipped to the same packing plant during the year 1951

This study is summarized in table 14 and consisted of 1,284 steers from a commercial feedlot in Gilroy, California, to Armour & Company's San Francisco plant. These cattle were trucked 70 miles and were in transit three hours (including time spent in weighing cattle). The weighing procedure with four exceptions was to take the cattle out of their home corral early in the morning without their morning feed. They had been allowed access to water throughout the night.

Table 14. A case study of fat cattle from the same feedyard, trucked 70 miles to packing plant during the year 1951

No. of cattle	Gross weight	Purchase weight	Off-car weight	Weight shrinkage G.W.	Weight shrinkage P.W.	% shrink G.W.	% shrink P.W.	Average weight G.W.	Average weight P.W.	No. of shipments
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Percent	Percent	Lbs.	Lbs.	No.
1/ 154	164,053	158,453	154,185	-10,868	-4268	-6.58	-2.69	1072	1029	4
2/ 1130	1322,245	1268,406	1277,550	-44,695	+9144	-3.38	+ .72	1170	1122	33
3/ 1284	1486,298	1426,859	1431,735	-59,439	+4876	-4.0	+ .34	1158	1111	37

1. Cattle shipped with fill considerations.

2. Cattle shipped without fill.

3. All cattle shipped from Gilroy, 1951.

The four exceptions had been allowed access to feed the morning of the shipment and showed a correspondingly higher shrinkage.

Armour & Company purchased these cattle with a 4 percent pencil shrinkage at the feedlot. The average shrinkage based on gross weight on the 1,284 head of cattle was 4.0 percent and the cattle showed a gain of .34 percent on their purchase weight. The four filled groups (154 head) of cattle showed a shrinkage of 6.58 percent on the gross weight and a shrinkage of 2.69 percent on the purchase weight. The remaining 1,130 head of cattle which were on the no-fill weighing basis showed a shrinkage of 3.38 percent on the gross weight and a gain of .62 percent on the purchase weight.

This study is an additional verification of the concept of 1 percent per hour shrinkage for the first four hours in transit if the cattle have not been filled prior to shipping. The 1,130 head of cattle weighed without any fill had an average gross shrinkage of 3.38 percent for a three hour trucking run. The cattle with some fill had a comparable shrinkage of 6.58 percent for the same run.

Visual inspection fails to show any difference between cattle of the various weight groups. The groupings are limited but percentage-wise any one group is not at variance with another.

One of the major values of this study is that it is an illustration of where conditions are comparable, shrinkage will tend to be comparable. The cattle showed a gain in weight over their purchase weight in 23 out of 33 lots where they were on the comparable weighing basis without fill. The range in these 33 varied from 1.83 to plus 4.16. The standard deviation is 1.05 percent. The 4 percent pencil shrinkage was more than adequate in the case of cattle which had not

taken on fill. When the filled animals are included in the total, then the 4 percent pencil shrinkage just covers for practical purposes the shrinkage occurring on this cattle run. This would be more true if more cattle had a fill consideration in this example.

TRANSPORTATION METHODS AND COSTS

Rail Methods

The railroads have a lot of problems in the movement of livestock. Because it costs too much compared with the revenue received, railroads would rather not take livestock on short hauls. They would prefer that the trucks take the short hauls. Rail revenue is increased by the longer hauls.

Railroads must provide more facilities for the handling of livestock than other commodities. The major rail system in Utah is the Union Pacific Railroad. The Union Pacific Railroad maintains about 800 livestock yards. Four hundred of these livestock yards are equipped with scales. The kind of facilities and other equipment that must be handled for other livestock enter into the cost providing the service. In addition to the country stock yards, the Union Pacific Railroad provides feedyards for the feeding and resting of livestock in transit. In the last 15 years (7) the average distance of movement of livestock has increased considerably until at the present time the average movement per car is over 500 miles, while 15 years ago it was only about 400 miles.

Some of the specialized equipment that is used in the handling of livestock are the new special livestock cars that operate out of Ogden and Salt Lake City to Los Angeles. These railroad cars are roller bearing equipped. They are a type of car that is devised to handle a single deck load or a double deck load. These new freight cars have steel wheels so that they can be run at a high speed. The

rail schedules have been shrotened accordingly, figure 3. Rates and transportation time shown to and from various points in the figure include time allowance for feed, water, and rest. The transportation time has been materially reduced from Ogden to Los Angeles. In 1930 it took 60 hours to go from Ogden to Los Angeles, but in 1947 transportation time was reduced to 30 hours. This was accomplished by faster freight schedules and the elimination of the feed, water, and rest stop at Las Vegas, Nevada. Faster schedules are more expensive for the railroads to maintain. The Ogden to Los Angeles rate was 14 cents in 1947 as compared with 64 cents in 1945. Further increases have taken place since 1947, and at present the rate is 98 cents from Ogden to Los Angeles. Table in the appendix presents the complete record of rail rates and time changes for representative points which are important to shippers of livestock in Utah.

Feed, water, and rest stops have been eliminated, so are advantages to shippers despite the increase in charges; less shrink also takes place with the faster runs. Cattle shippers have recognized this on the central Utah run where the railroad effectively competes with trucks in that area. Rail rates are cheaper than truck rates in this area and the running times are practically identical.

The rail runs from Ogden to San Francisco, California, have not improved. Ogden to San Francisco by way of the Southern Pacific Railroad Company has remained 72 hours in the 20-year period. Denver, Colorado, is still almost as many hours away as it was 20 years ago. Omaha, Nebraska, is four hours faster at the present time than it was in 1930 as compared to a reduction of 32 hours over a shorter run from Ogden to Los Angeles.

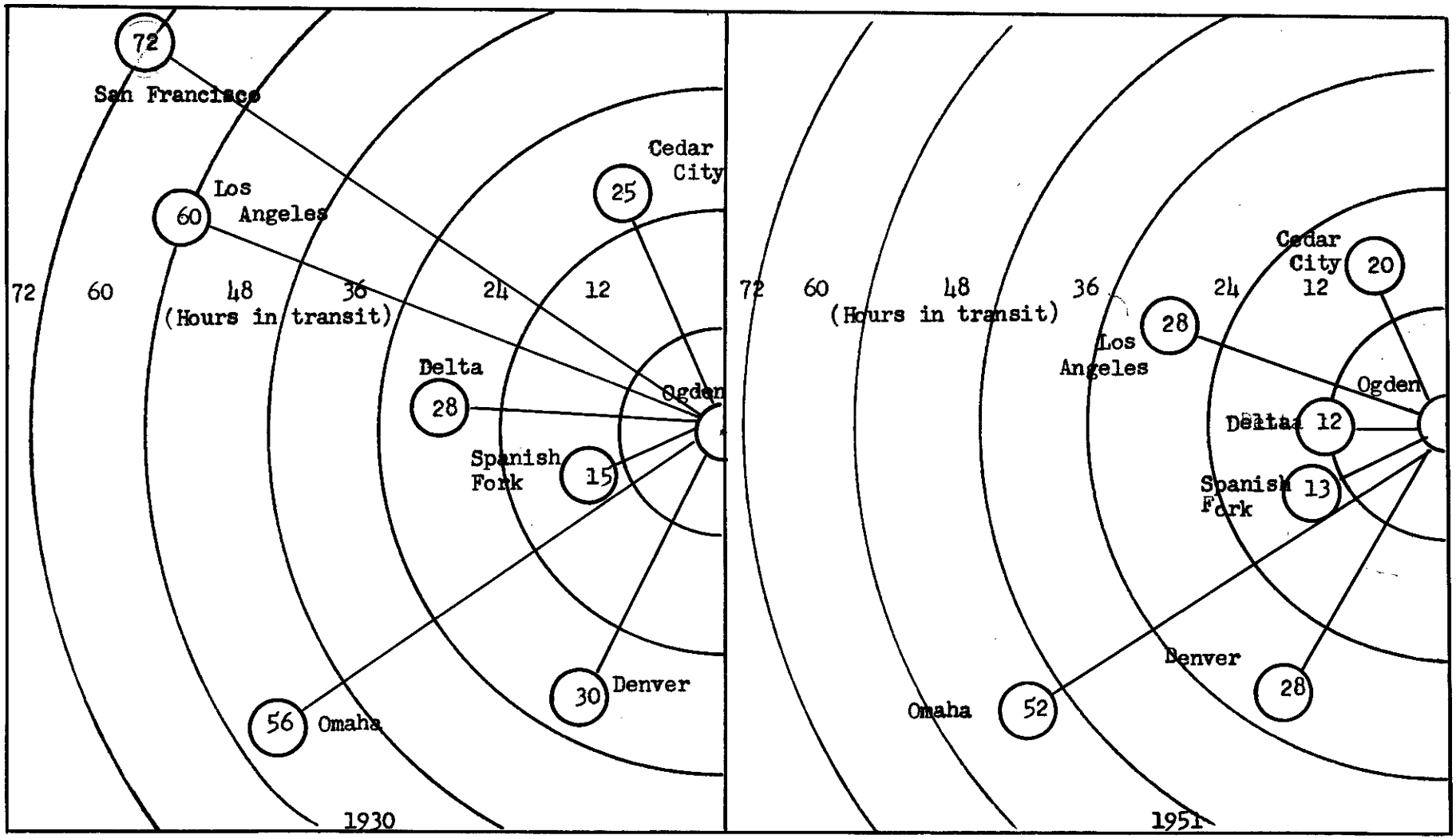


Figure 3. How freight schedules have been improved between 1930 (left) and 1951 (right) between selected points

The Union Pacific Railroad has recognized that time means money to the shipper and have acted accordingly on their central Utah run. In general the Union Pacific Railroad, which is Utah's livestock railroad, is doing an outstanding job in the handling of livestock and getting livestock to Los Angeles. This is important because Los Angeles is the major livestock market of this area. The Union Pacific has been able to provide these improved services to Los Angeles but has not found it desirable to make corresponding improvements in the movement of livestock to eastern points.

A problem of railroads that is not usually encountered by competing trucks is that the cars usually move back empty from the markets. In the United States there are about 55,000 stock cars. Of those 55,000 stock cars, the three largest western railroads have about 25 percent. Another problem is the seasonal movement. The Union Pacific Railroad, for example, (7) handles 100 thousand cars of livestock per year. Around 600 car loads are handled in the month of January and each spring month. During the month of October the U. P. system handles about 800 cars of livestock. In order to provide sufficient equipment to handle such an amount of stock within the 30-day period, the railroad has to have on hand a large number of stock cars that are not ordinarily used in the summer months. May, June, and July are the months of the lowest volume. Frequently the railroads need a special engine crew that does nothing but load stock which also affects costs of the service.

Railroads have a very low ratio of loss. At the present time rail losses amount to about $3.50 per car (7) on the Union Pacific System as payments of claims for dead and crippled livestock. It

is a different story in the case of horses because there is an average of $12.50 per car in claims on horses that are shipped.

Current rates and running time on ordinary and feeder cattle by rail from selected points in Utah and such major markets as Los Angeles, San Francisco, Denver, Ogden, and Omaha are shown in table 15. This table is an illustration of what the shipper might expect in the way of costs and running times and is presented to permit the calculation of costs and running time for representative shipping points in Utah to principal markets for Utah cattle.

Trucking Methods

The trucks have been handling an increasing volume of livestock in the United States. This increase, in the case of cattle, has been from 1.4 percent (3) in 1916 to 24.9 percent in 1941 and 68.7 percent in 1948 (6). This increase has been due largely to the following factors: (1) better roads and highways, (2) conveniences of marketing, (3) reduced time in transit, (4) flexibility in marketing (choice of marketing), (5) reduced trucking charges.

Current trucking time and rates to and from selected points in Utah and Idaho are presented for contrast with shipments by rail in table 16. Los Angeles, San Francisco, Denver, and Ogden were selected as major markets. The Los Angeles truck run is most important in the shipments out of the state of Utah.

One of the recent developments in livestock trucking has been the use of the covered truck. There has been considerable controversy whether the covered truck has or has not an advantage over conventional open type truck. An example of covered truck versus open truck movement of livestock was available for study in this study. A shipment

Table 15. Current rates on ordinary and feeder cattle by rail from and to points shown below

From \ To	Los Angeles, Calif.			San Francisco, Calif.			Denver, Colo.			Ogden, Utah			Omaha, Nebr.		
	Fat Dol.	Feeder Dol.	Time Hrs.	Fat Dol.	Feeder Dol.	Time Hrs.	Fat Dol.	Feeder Dol.	Time Hrs.	Fat Dol.	Feeder Dol.	Time Hrs.	Fat Dol.	Feeder Dol.	Time Hrs.
Ogden, Utah	$ .98	$.83½	28	$ .94	$.80	72	$.82	$.69½	28	$ --	$ --	--	$1.12	$ .95	60
Delta, Utah	.85	.72½	25	1.04	.88½	72	.81	.69	40	*76.60	57.28	12	1.18	1.00½	72
Richfield, Utah	1.00	.85	43	1.08	.92	76	.92	.79	32	*76.80	76.80	18	1.30	1.10	50
Spanish Fork, Ut.	.92	.78	31	1.00	.85	72	.82	.69½	40	*52.90	39.50	8	1.12	.95	70
Payson, Utah	.91	.77½	30	1.00	.85	74	.82	.69½	42	*52.90	39.50	12	1.12	.95	72
Price, Utah	.98	.83½	41	1.05	.89½	76	.80	.67	28	*101.44	101.44	16	1.14	.98	50
Cedar City, Utah	.80	.68	22	1.00	.85	80	.85	.72½	48	*124.62	93.47	20	1.21	1.03	80
Heber, Utah	.87	.74	31	1.01	.86	70	.82	.70	29	*44.92	44.92	8	1.12	.95	55

Note: Rates in dollars and cents per cut except as noted, minimum weight ordinary cattle 24,000 per 36 foot cars.

Rates in dollars and cents per cut except as noted, minimum weight ordinary cattle 22,000 per 36 foot cars.

* Rates are in dollars and cents per 36 foot car, plus 3 percent federal transportation tax.

Table 16. Time and rates by truck to and from selected points, 1951

To / From	Los Angeles, Calif.		San Francisco, Calif.		Denver, Colorado		Ogden, Utah	
	Time	Rate	Time	Rate	Time	Rate	Time	Rate
	Hrs.	Dol.	Hrs.	Dol.	Hrs.	Dol.	Hrs.	Dol.
Delta, Utah	18	$1.10	28	$1.30		$1.15	5	$ .40
Richfield, Utah	18	1.10	30	1.35		1.10	6	.40
Cedar City, Utah	15	1.10	30	1.30		1.20	8	.60
Idaho Falls, Idaho	31	1.50	28	1.50				
Ogden, Utah	24	1.10	24	1.15		1.10		

of 55 steers were gate cut into two lots and trucked from Oakley, Idaho, to Salt Lake City, Utah. The cattle in the open truck shrank 1 percent more off-truck than did the cattle in the closed truck. This may or may not be evidence that the closed truck is superior to the open truck. The idea of the closed truck over the open truck will bear further investigation.

The covered truck apparently has several advantages over the open truck. The major advantage is the protection from weather conditions. The covered truck offers protection both from inclement weather and the hot sun. It also offers a uniformity of temperature within the truck. The truck provides some additional warmth and protection for the cattle in the winter, and the aluminum sides and top reflect the heat of the summer time. Another advantage is that cattle seem to remain quieter in transit and they are not frightened by objects along the roadway. This is thought to be a weight saving

factor particularly with tempermental cattle. This study did not find enough examples to test the above supposition. The men in the industry were divided in their opinions of covered versus closed trucks; the majority felt that the covered were probably superior but did not have concrete evidence to support their feelings.

Rail Versus Truck Transportation

The truck is taking an ever increasing volume of the livestock into the markets of the United States. Because of this it was thought that an analysis of Utah's major market, Ogden, would be desirable. An analysis was made of the percent that truck shipments were of total receipts from 1932 to the present time. These data were available at the office of the Ogden Union Stock Yards Company and were expressed in car load equivalents of livestock unloaded. Out-shipments were available from 1939 and on. Table 17 shows the volume increase or decrease since 1932. In 1932 truck receipts were 8.5 percent of total receipts; in 1951 the truck receipts were 25.3 percent of total receipts. There was considerable variation from year to year in percentage of truck receipts. In 1933 truck receipts were 8.75 percent of total receipts and jumped to 11.34 percent in 1934 and climbed steadily until 1939 when 25.62 percent were handled by trucks. In 1942 the figure was 24.32 percent; as a result of wartime restrictions, was 11.77 percent in 1943. The truck receipts fluctuated between 14 percent and 19 percent during the war years. Since 1948 truck receipts have again increased at the Ogden market.

Table 17 also shows the effect of the war on truck and rail receipts as to choice of methods of transportation and also

Table 17. Ogden Union Stockyards - rail and truck receipts of livestock

Year	Rail cars in No.	Truck in 1/ (RR cars) No.	Total RR & truck No.	Percent truck Percent	Out RR cars No.
1932	14218	1245	15463	8.05	
1933	14404	1391	15887	8.75	
1934	16841	2155	18994	11.34	
1935	15556	2535	18091	14.01	
1936	12507	2854	15361	18.58	
1937	11031	3285	14316	22.95	
1938	11031	3285	14316	22.95	10939
1939	11196	3857	15053	25.62	11059
1940	11879	3551	15403	23.05	12205
1941	13642	4303	17945	23.98	13653
1942	14934	4801	19735	24.32	14838
1943	17548	2340	19888	11.77	16932
1944	18424	4404	22828	19.29	18406
1945	21189	3865	25054	15.43	21198
1946	22698	3757	26455	14.20	22555
1947	20171	4651	24823	18.74	19928
1948	17574	5548	23122	23.99	17721
1949	15048	5494	20578	26.70	15579
1950	18573	6261	24834	25.21	19276
1951	17398	5967	23365	25.53	17205

1. Changed to rail car basis.

illustrates the effect of the depression. A straight line trend is presented in figure 4 along with the individual observation from year to year. Figure 4 illustrates more graphically than the table the violent fluctuations in percent of truck proceeds of total receipts at Ogden. The straight line trend shows that truck receipts showed a percentage-wise gain of .57 percent each year. The years from 1931 to 1951 were not always what might be considered normal years. The years from 1944 to 1947 showed the effects of gasoline rationing and other associated war factors including the shortage of labor to drive trucks.

The situation that has occurred at Ogden is not typical of what has happened in most of the major markets in the United States. Most of the major markets in the United States have shown a decided increase from year to year in percent that truck receipts are of total receipts. The motor truck is not making the in-roads in livestock transportation at Ogden that it is in the other major markets in the United States. The railroad is, for practical purposes, almost holding its own as a method of transportation into that market. There are several causes of this: (1) Ogden is a through feeding stop for cattle destined for Los Angeles and San Francisco and eastern markets; (2) the natural situation that exists at Ogden -- Ogden is a central rail terminal serviced by some of the best rail facilities in the United States; (3) the fact that most of the cattle coming into Ogden came from considerable distances and from areas well serviced by railroads; (4) the major source of cattle are from out of state and considerable distance from Ogden; (5) the major trucking area market is in southern Utah where the strong influence of the Los Angeles market is felt;

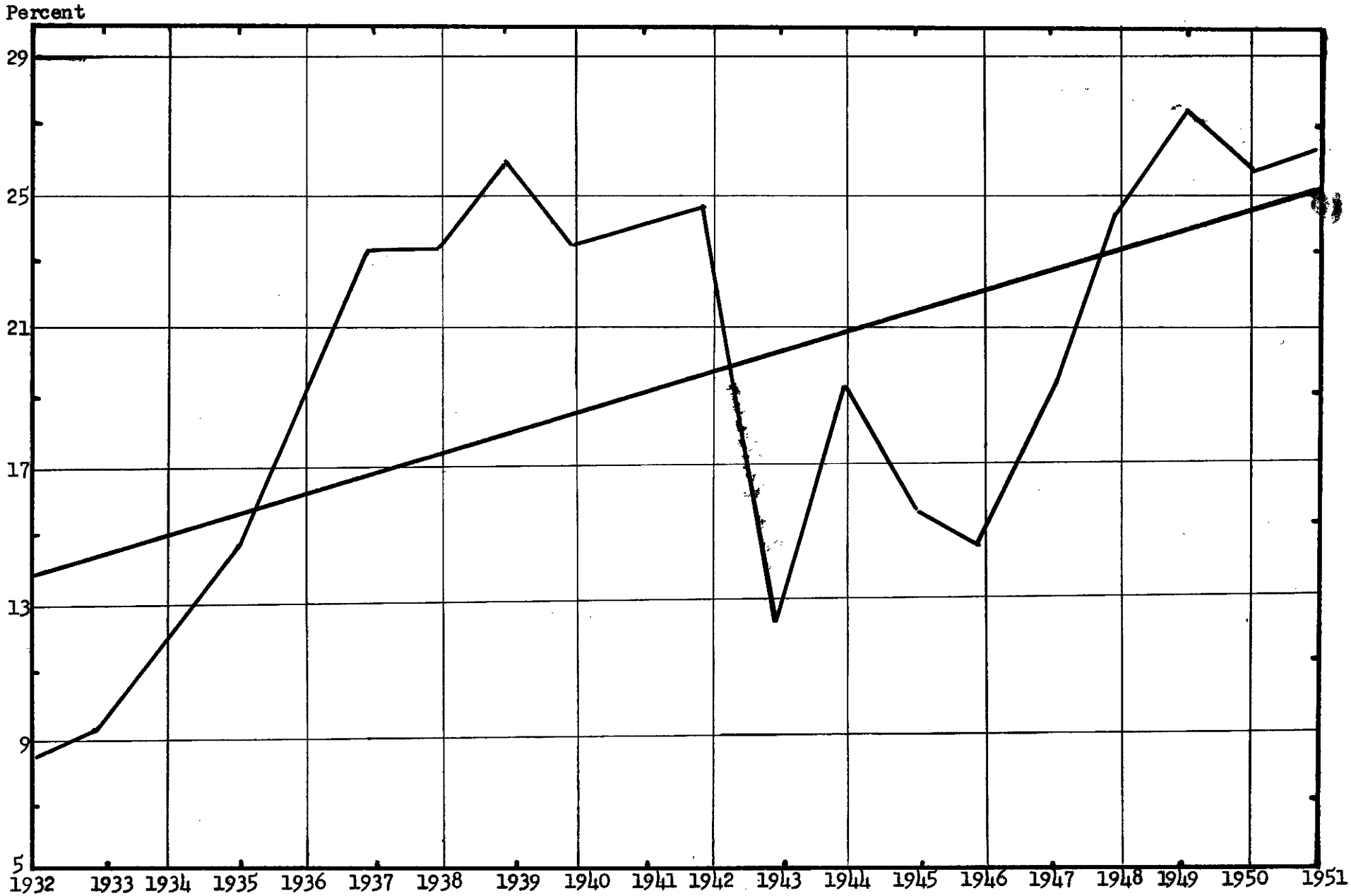


Figure 4. Percent truck receipts were of total receipts at Ogden Stockyard, 1932 - 1951

(6) country markets are proving to be concentration points for many of the rail shipments into Ogden.

Comparison of truck versus rail

Fifty head of 1,100-pound feedlot steers were shipped from Pleasant Grove, Utah, to Los Angeles, California. The custom of the shipper had been to truck to Salt Lake City and ship to Los Angeles by rail. The truck line operator convinced the shipper that he should give truck line methods a trial. The 50 head of steers were gate cut into two lots of 25 steers each. One lot went by truck from Pleasant Grove to Los Angeles, and the other lot was trucked to Salt Lake City and shipped by rail to Los Angeles from there. The 25 steers that were trucked to Los Angeles yielded 62 percent and the 25 that were trucked and shipped by rail yielded 60 percent. These animals had been pencil shrunk 2 percent out of the feed lots without fill and sold on a grade and yield basis. This particular shipper trucked the remaining 100 steers in his feedlot to Los Angeles. Charges in this case were 96 cents per hundred by rail and $1.10 by truck.

The truck line operator and the shipper both thought that much of the difference in yield was due the shorter transportation time of the cattle being trucked directly to Los Angeles. This is an observation to be confirmed in another case history discussed on page . This case history discussed the difference in slaughter yield of comparable cattle killed immediately and cattle which had been in transit 28 hours before slaughter. Another contributing factor was the additional jostling and handling caused by the trucking, the unloading, and the standing in the Salt Lake yards and the re-loading into the rail car.

A second example of truck versus rail movement of cattle from

Idaho Falls to Los Angeles was also available. The shrinkage from Idaho Falls to Los Angeles was 6½ percent by truck and 10 percent by rail based on pay weight and weight off-car before fill-back. The shrinkage difference is probably due to time. It is 31 hours from Idaho Falls to Los Angeles by truck and 72 hours by rail. The rail time includes the feed stop at Ogden. Truck rates are $1.50 per hundred as compared with a $1.15 by rail. The 35 cent freight differential is still strong enough in the minds of most cattle shippers in that area to cause a marked preference for rail over truck. The truck line operator did not feel that the $1.50 freight charge was excessive when time and shrinkage elements were considered. The truck line operator also was of the opinion that he would have to be able to lower freight rates from Idaho Falls to Los Angeles to $1.35 before he could effectively compete with the railroads for the cattle shippers' business. At the present time he could not lower the rates unless a large volume of business justified it.

Time and rate comparisons from selected points both rail and truck in 1951 are given in table 18. Points in Utah to major markets are compared both as to time and as to rate. The major markets included Los Angeles, San Francisco, Denver, and Ogden. Rail and truck times are given in both cases.

The truck can effectively compete with the railroad up to a time of 30 hours or so. The truck running time in most points in the west is faster than the rail time, although rail rates are generally cheaper. The truck has a distinct advantage on the short run in the time element consideration and the fact that trucks are convenient and usually represent the most effective way to get cattle to market. On the long

Table 18. Time and rate comparisons from selected points for both rail and truck, 1951

From \ To	Los Angeles, Calif.				San Francisco, Calif.				Denver, Colo.				Ogden, Utah			
	Rail		Truck		Rail		Truck		Rail		Truck		Rail		Truck	
	Time	rate	time	rate	time	rate	time	rate	time	rate	time	rate	time	rate	time	rate
	Hrs	Dol.	Hrs	Dol.	Hrs	Dol.	Hrs	Dol.	Hrs	Dol.	Hrs	Dol.	Hrs	Dol.	Hrs	Dol.
Delta, Utah	25	.85	18	1.10	72	1.04	28	1.30	40	.81		1.15	12	.76	5	.40
Richfield, Utah	43	1.00	18	1.10	76	1.08	30	1.35	32	.92		1.10	18	.76	6	.40
Cedar City, Utah	22	.80	15	1.10	80	1.00	30	1.30	48	.85		1.20	20	1.24	8	.60
Idaho Falls, Idaho	72	1.15	31	1.50			28	1.50							5	.50
Ogden, Utah	28	.98	24	1.10	72	.94	24	1.15	28	.82		1.10				

distance runs the picture changes and the railroad comes into its own. The railroad has facilities for unloading and feeding which the truck line does not. The railroad can make long-distance runs cheaper than the truck can. So the truck is limited in its range of operations. The truck also cannot reach beyond 30 to 36 hour limit because of the necessity of having to feed the cattle and having a place to bed, feed, water, and rest. This is in addition to the rate considerations. Trucks have been and will no doubt continue functioning effectively as feeders to the railroads in assembling livestock.

The railroad can compete effectively with the truck on the Los Angeles run out of Utah. Speeded-up freight schedules have made the rail schedules as fast as the truck time. The railroad has cheaper rates and can compete most effectively with the truck on the cattle run from central Utah to Los Angeles. The story is exactly opposite on the run from Los Angeles to Sanpete-Sevier area where the rail rate is cheaper, but the rail running time is over twice that of the truck.

COMMISSION, FEED, AND OTHER MARKETING COSTS (CHARGES)

The detailed data for this section are presented in the appendix and in the form that they appear in the tariff schedules of the Ogden Union Stockyards Company, the United States Department of Agriculture feeding requirements and other regulations, in Union Pacific Railroad tariffs; and the usual auction fees that are charged at Utah auctions. The tariff charges of the Ogden Union Stockyards were selected because Ogden is Utah's major cattle market and the tariffs there are representative of the charges that may be found at any major market. The U.S.D.A. feeding regulations are uniform throughout the United States so are presented as they now exist. The selling fees and the other charges at auctions vary slightly among the auction markets of the state.

The use of these uniform rates and charges are illustrated by a case history example of a load of cattle which was shipped to the Los Angeles market by rail from central Utah. The commission, freight, yard, and other charges are itemized along with the fillback consideration to illustrate what charges do occur on a typical cattle shipment.

The charges that are presented in the appendix are subject to constant change and hence must be used as general guides subject to constant revision.

Case history

These are the expenses that occur in transit and at the market for a carload of cattle (36 head) shipped by rail from Delta, Utah, to Los Angeles, California. They were shipped from Delta on December 16, 1951, and arrived in Los Angeles on December 17. Thirty-two head

of the cattle were sold on December 19 and four head were sold a week later on December 26. The off-car weight on these cattle was 27,360 pounds and the selling weight was 28,100 pounds, a fillback of 740 pounds. This was a fillback of 2.7 percent on the shipping weight. A breakdown of the cash expenses is listed below:

Thirty-two head sold December 19:	
Freight charges	$189.14
Yardage	22.48
Insurance	.15
Hay - 2,090 pounds @ $3.20 cwt.	66.88
Bedding - 220 pounds @ $1.70 cwt.	3.74
	.25
Commission - 3 @ $1.75, 15 @ $1.20, 14 @ $1.00	40.00
	$322.64
Additional expenses on four head sold December 26:	
Freight undercharged	$ 12.39
Hay - 280 pounds @ $3.20 cwt.	8.96
Bedding - 40 pounds @ $1.70 cwt.	.68
Commission - 2 @ $1.00, 2 @ $.65	3.30
Vaccination on calves, 4 @ $.35 per head	1.40
	$ 26.73
TOTAL EXPENSES	$349.37

METHOD OF COMPUTING MARKETING COSTS

The producer should have some basis for computing his cattle marketing costs so that he may make an intelligent marketing decision. Most producers do not have a knowledge of what their marketing costs and their returns would be from their alternative markets. It has been the purpose of this study to give the producer that information. A producer's cattle marketing costs can be computed in this manner and by the use of the following steps using information presented in this study.

(1) What are the transportation rates and which method of transportation fits the particular case?

(2) What are the feed and commission charges at the market?

(3) Will any other expenses be incurred on a particular cattle run?

(4) What will be the difference in shrinkage? (When faced with alternatives, a knowledge of fillback is important.)

(5) Reduce the expenses to a cost per hundred weight figure for each alternative market and compare it with the price that may be received at each alternative market.

An example of how this may be applied can be seen from the case history example from Delta, Utah, to Los Angeles, California, on page . Total expenses on this car of cattle amounted to $349.37 or a cost of $1.24 per hundred weight cash costs. These cattle shrank an additional 2 percent (540 pounds) over what they would have done if they had been sold in Delta making the selling cost $1.71 per hundred weight. This $1.71 per hundred weight figure was arrived at by adding 540 pounds at 27 cents per pound to the total cost figure and adding the 540 pounds to the total weight figure. Price differences and relationships could

easily change this figure somewhat. This figure is in line with the "rule of thumb" figure which dealers and speculators in the Delta area use. It takes a difference of 2 cents per hundred weight more in Los Angeles before it is profitable to ship there from the Delta area.

The producer can use this method in calculating his costs both tangible and intangible when he is faced with alternative marketing decisions. Another factor for consideration is the element of price risk the producer takes in shipping to a distant market. The producer also needs to have a working knowledge of cattle grades when marketing his cattle regardless of where they are sold, otherwise market price reports are valueless as an aid in formulating a marketing decision.

SUMMARY AND CONCLUSIONS

An understanding of the amount and variability of costs of marketing cattle is complicated by the inadequate information about loss of weight encountered when livestock are handled and moved from place to place. This thesis presents an analysis of masses of shrinkage data, under the assumption that by such means general relationships can be established even though it must be recognized there is considerable variability in this item affecting marketing costs.

Time in transit is the principal factor affecting shrinkage of cattle, but the actual weight loss may be modified by the following:

(1) Kind of cattle (slaughter or feeder; calves or mature animals);

(2) Nature of the fill and the amount of the fill before shipping;

(3) Weather conditions and season of the year;

(4) Time allowed for fillback before sale;

(5) Preshipping and after unloading conditions and treatment.

Net shrinkage in cattle is proportionate to weight. Steer shrinkage is somewhat less than cow shrinkage. Steer and heifer shrinkage is essentially the same. Calf shrinkage is also proportionate to weight. These statements assume essentially identical conditions and same fillback period and conditions.

There is not a great deal of difference between the net shrinkage of fat cattle and feeder cattle for equal periods of time. The feeder and the fat cattle must be subjected to essentially the same weighing conditions with the additional provision that the feeder cattle must have been on nutritious feed and a radical difference is not made in

the type of feed the feeder cattle have been consuming. There must also be a comparable fillback period.

Utah auction conditions sometimes give an equivalent shrinkage to that commonly taken off with a pencil in country trading. This is a very general statement and varies from auction to auction.

Most of the shrinkage takes place the first 24 hours that cattle are in transit with a high proportion of that first shrinkage taking place the first ten to twelve hours.

Cattle shrink as much or more in strange yards (first move) without feed and water as while in transit for the same period of time.

An excessive fill before shipping is not to be desired as it leads to an excessive tissue and excretory shrinkage.

Net shrinkage apparently may be reduced by:

(1) Keeping livestock off abnormal amounts of feed and water before shipping;

(2) Reducing feed before shipping;

(3) Allowing animals to rest after shipping before allowing access to feed and water.

Cash costs involved in marketing are fairly well understood and are readily available to farmers as well as dealers of livestock.

Transportation costs have increased materially in recent years. The type and availability of service, time in transit, as well as cost are important in deciding the most desirable means of shipping cattle.

Improved service and reduction in time of transit has been an outstanding accomplishment of the Union Pacific Railroad between Ogden, Salt Lake City, and other loading points in Utah and California unloading points.

The author realizes that in a study of this type any conclusion

that is reached requires qualification and explanation because of the lack of uniformity in practices followed in handling livestock prior to and during the actual marketing operation.

Lack of available data was a limiting factor in this analysis, particularly for the short hauls. Livestock moved short distances to market are seldom weighed before and after shipment and usually are not fed and rested prior to sale.

If this study enables the cattle producer to better understand his costs of marketing and enables him to intelligently appraise his alternative choices, then a real economic contribution could be made by this study. The author feels that a more intelligent handling of cattle prior to initial loading and in transit could significantly reduce unnecessary weight losses (shrinkage) and contribute to a more prosperous and efficient agricultural economy in Utah and the west.

APPENDIX

APPENDIX I

Shrinkage of Weight of Beef Cattle in Transit

Summary of Conclusions of Bulletin 25, U.S.D.A., 1913, 78 pp., W. F. Ward.

1. The shrinkage of cattle in transit depends materially upon:

   (a) The conditions existing at the time of shipping and upon the treatment received during the drive to the loading pens.
   (b) The length of time the cattle were held without feed and water before being loaded.
   (c) The nature of the fill which the cattle had before loading. If it was of succulent grass, beet pulp, or silage, a great loss in weight was experienced.
   (d) The weather conditions at the time of loading and while in transit.
   (e) The character of the run to market. Slow rough runs naturally caused a greater shrinkage.
   (f) The kind of treatment they received at unloading stations.
   (g) The time of arrival at market. If they arrived just before being sold, the fill was small. Cattle that were shipped a long distance and arrived at market during the night usually did not fill well. If they arrived the afternoon before or about daylight of the sale day, they generally took a good fill.
   (h) The climatic conditions at the market.

2. An exceedingly large fill at the market is not desired, as it will detract from the selling price.

3. The shrinkage on calves may seem small, but under normal conditions it holds about the same proportion to their weight as is found with grown cattle.

4. The difference between the shrinkage of cows and steers is not as great as is ordinarily supposed. Steers will shrink somewhat less than cows of the same weight.

5. The shrinkage during the first 24 hours is greater proportionately than for any succeeding period of the same duration.

6. The shrinkage of cattle was found to vary in direct proportion to their live weight when conditions were the same and all other factors were equal.

7. The shrinkage of range cattle in transit over 70 hours during a normal year is from 5 to 6 percent of their live weight. If they are in transit 36 hours or less, the shrinkage will range from 3 to 4 percent of their live weight.

8. The shrinkage of fed cattle does not differ greatly from that of range cattle for equal periods of time. It varied from about 3 percent with all of the silage-fed cattle and 4.2 percent with the corn-fed cattle, when both classes of these animals were in transit for less than 36 hours, to 5.4 percent for pulp-fed cattle which were in transit from 60 to 120 hours.

9. Cattle fed on silage have a large gross shrinkage but usually fill so well at market that the net shrinkage is small.

10. Pulp-fed cattle shrink more in transit than any other class of cattle, and also present a greater net shrinkage.

11. The shrinkage on cattle is proportionately smaller for each 12 hours they are in transit after the first 24 hour period is passed. This shows very clearly in table 1, appendix, which presents a general summary of the work.

12. For a long journey the common method of unloading for feed, water, and rest is to be preferred to the use of "feed and water" cars.

13. Cattle should be weighed before being loaded whenever practicable, since a comparison of this weight with the sale weight will show the net shrinkage. Moreover this weight at point of origin may be of material benefit to the shipper in case of a wreck or a very poor run to market.

Appendix table 1. A copy of: "Table 29, Page 73. General Summary of Three Years' Shrinkage Work"

Class	Number of shipments	Number of cattle	Average weight at origin	Gross Shrinkage		Fill at market		Net shrinkage		Ratio of shrinkage to live weight at origin
				Range	Ave.	Range	Ave.	Range	Ave.	
			Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Percent
Range steers in transit less than 36 hours.	2	197	794					19-55	29	3.65
Range steers in transit 36 to 72 hours.	8	882	1,186	57-124	89	13-41	25	26-83	64	5.40
Range cows in transit less than 24 hours.	15	1,724	838	33-105	60	5-88	30	12-60	30	3.58
Range cows in transit 24 to 36 hours.	21	1,551	896	38-129	70	9-70	39	5-64	31	3.46
Range cows in transit 36 to 72 hours.	4	275	1,034	90-110	96	36-56	46	34-72	50	4.84
Range cows in transit over 72 hours.	3	177	1,010	49-85	70	28-35	30	21-56	40	3.96
Mixed range cattle in transit less than 24 hours.	21	1,511	700	19-84	37	1-56	22	12-71	15	2.14
Mixed range cattle in transit 24 to 36 hours.	17	872	848	27-118	72	-8-55	18	19-114	54	6.37
Mixed range cattle in transit 36 to 72 hours.	10	622	954	25-110	76	9-47	39	1-51	37	3.88
Mixed range cattle in transit over 72 hours.	6	988	729	42-96	80	16-40	29	7-71	51	7.00

Appendix table 1. (Continued)

Class	Number of shipments	Number of cattle	Average weight at origin	Gross shrinkage		Fill at market		Net Shrinkage		Ratio of shrinkage to live weight at origin
				Range	Ave.	Range	Ave.	Range	Ave.	
			Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Percent
Range calves in transit less than 24 hours.	8	773	185	1-13*	6*	6-13*	7*	≠ 14-13	≠ 1	- .59
Range calves in transit over 24 hours.	8	772	193	6-11*	6**	-3-17**	11**	≠ 9-13	≠ 5	≠ 2.45
Mixed corn-fed cattle in transit less than 24 hours.	4	164	1,303	59-95	67	4-48	16	20-64	51	3.91
Mixed corn-fed cattle in transit 24 to 36 hours.	59	1,853	1,167	47-128	85	19-52	37	18-88	48	4.11
Mixed silage-fed cattle in transit less than 24 hours.	14	666	1,168	46-128	76	6-97	52	≠ 7-67	24	2.05
Mixed silage-fed cattle in transit 24 to 36 hours.	4	169	1,204	84-121	101	50-64	58	27-75	43	3.57
Cottonseed meal-fed steers in transit 30-48 hours.	10	1,296	1,074	61-76	72	9-21	14	41-73	58	5.40
Beet pulp-fed cattle in transit 60 to 120 hours.	10	1,009	1,390	90-111	100	11-26	25	16-99	75	5.40
Beet pulp-fed cattle in transit 38 to 120 hours.	32	2,614						≠ 5-132	54	

Footnotes on next page.

Footnotes for Appendix Table 1.

Note: The data were incomplete on the shipments where blank spaces are found.
Note: The plus sign (+) indicates a gain in weight instead of shrinkage. Attention is called to the 16 shipments of range calves, wherein the ratio of shrinkage to live weight (last column of table) is unduly low, because the great majority (13) of the shipments occurred in 1910, the droughty years. The 3 shipments in 1911, the normal year, gave a ratio of 4.9 per cent.
Note: The minus (-) sign indicates a loss in weight instead of a fill.
* Data on 635 head.
** Data on 699 head.

APPENDIX II

The Chicago Union Stock Yard and Transit Company study sheds light on the period of time that shrinkage does take place; and although the number of cattle involved was small, the controlled conditions make the study significantly accurate for consideration. The summary statement of this study and three of the tables are presented for comparative purposes.

Summary

Seventy-five head of fat steers were loaded from farm feedlots and hauled 200 miles on a truck. While enroute the cattle were weighed individually on a specially constructed Fairbanks-Morse registering beam scale mounted in the rear of the truck trailer. The weights were taken when the steers were loaded, and also after 25, 50, 100, and 200 miles of the truck haul.

The amount of shrink and the interval during which it occurred varied slightly in the different cattle weight classifications. Light steers (under 1,000 pounds) tended to shrink fewer total pounds than heavy steers. However, these pounds of shrink represented as large or a larger percent of the total animal weight for the light than for the heavy fat steers.

Sixty head of steers averaged 44.3 pounds of shrink (75 head averaged 42.9 pounds) during the 200-mile truck haul. The average percent of total animal weight shrinkage was 3.9 percent. Only .6 percent of the 3.9 percent took place in the last 100 miles, which is a rather small amount of the total shrink for entire 200 miles.

This investigation proves that shrink for fat cattle in transit takes place at an extremely rapid rate in the very first part of the haul, 46.3 percent in the first 1/8 of the trip, and after the first 25 miles shrink occurs at a rapidly decreasing rate.

All of the figures in this study are presented on a gross shrink basis since the cattle received no feed or water during the entire test. A substantial part of the shrink was regained after the animals were returned to the feedlot and had access to feed and water.

Appendix table 2. Copy of: Table 1, Pounds of shrink for 60 fat cattle between each check weighing during a 200 mile truck haul

Weight classes	Number of head in each class	Average weight	Miles traveled between weighings 0-25	25-50	50-100	100-200	Total pounds
			Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Group average	60	1122	20.5	8.2	8.7	6.9	44.3
Under 1000 lbs.	11	954	14.6	6.8	8.6	7.7	37.7
1000-1099 lbs.	10	1056	21.5	10.0	8.5	3.5	43.5
1100-1199 lbs.	24	1139	20.4	9.4	8.6	8.1	46.5
Over 1200 lbs.	15	1263	24.3	6.0	9.0	6.7	46.0

Appendix table 3. Copy of: Table 2, Percent of shrink for 60 fat cattle between each check weighing during a 200 mile truck haul. (Total pounds of shrink equal 100 percent)

Weight classes	Number of head in each class	Average weight	Miles traveled between weighings 0-25	25-50	50-100	100-200	Total percent
			%	%	%	%	%
Group average	60	1122	46.3	18.5	19.6	15.6	100.0
Under 1000 lbs.	11	954	38.6	18.1	22.9	20.4	100.0
1000-1099 lbs.	10	1056	49.4	23.0	19.6	8.0	100.0
1100-1199 lbs.	24	1139	43.9	20.2	18.4	17.5	100.0
Over 1200 lbs.	15	1263	52.9	13.0	19.6	14.5	100.0

Appendix table 4. Copy of: Table 3, Percent of shrink for 60 fat cattle between each check weighing during a 200 mile truck haul. (Total animal weight equals 100 percent)

Weight classes	Number of head in each class	Average weight	Miles traveled between weighings 0-25	25-50	50-100	100-200	Total percent
			%	%	%	%	%
Group average	60	1122	1.8	.7	.8	.6	3.9
Under 1000 lbs.	11	954	1.5	.7	.9	.8	3.9
1000-1099 lbs.	10	1056	2.1	.9	.8	.3	4.1
1100-1199 lbs.	24	1139	1.8	.8	.8	.7	4.1
Over 1200 lbs.	15	1263	1.9	.5	.7	.5	3.6

Shrink Characteristics of Fat Cattle Transported by Truck. Chicago Union Stock Yard and Transit Co., Chicago, Illinois, Dec., 1951.

Appendix table 5. Rat· ·8 hours for 1 or 2 FW&R stops 1/

From	T	Ogden, Utah Feeder	Time	Omaha, Nebr. Fat	Feeder	Time
Ogden, Utah	19					
	19			70½	60	56'
	19			70½	60	56'
	19			74	63	56'
	19			74	63	56'
	2/19			83	72	52'
				112	95	60'
Delta, Utah	19					
	19	56.50PC	28'	67	--	96'
	19	56.50PC	28'	69½	67½	96'
	19	43.58PC	28'	84	72	96'
	19	43.58PC	28'	84	72	96'
	2/19	50.12PC	23'	97	83	90'
		57.28PC	12'	118	100½	72'
Spanish Fork, Utah	19					
	19	27.38PC	15'	70½	60	78'
	19	27.38PC	15'	70½	60	78'
	19	28.75PC	15'	74	63	78'
	19	28.75PC	15'	74	63	78'
	2/19	33.05PC	13'	85	72	72'
		39.50PC	8'	112	195	70'
Cedar City, Utah	19					
	19	79.50PC	25'	67	--	100'
	19	79.50PC	25'	79	67	100'
	19	67.73PC	25'	83	70½	100'
	19	67.73PC	25'	87	70½	100'
	19	77.89PC	22'	100	81	94'
		93.47PC	20'	121	103	80'

Source: Union Pacific

Note: 1947 time reduce

1947 from Salt L

1. Approximate time wh epending on schedules for handling livestock.
2. Plus 3 percent fede

APPENDIX IV

An example of costs encountered by rail is the story of two 36-foot rail cars and the 36-foot trailer car from White Sulphur Springs, Montana, and Spanish Fork, Utah. This is a typical case study of rail transportation. This study is not over the speeded up freight routes, but rather is one that might be considered as a typical freight rate and time study. One hundred and eighteen stocker calves averaging 363 pounds were cut off their mothers and hauled 30 miles and weighed without a pencil shrinkage at White Sulphur Springs.

Case study

They had been on dry mountain range with their mothers. The calves were loaded on October 19 and were unloaded at Spanish Fork five days later on October 24. These calves weighed 325 pounds at Spanish Fork, an off-car shrinkage of 10½ percent. The calves were unloaded and fed at Butte, Montana, and Ogden, Utah. They contacted shipping fever and were given serum in Ogden. Expenses were $601.33 or an average of $5.10 per head or 1.4 cents per pound for expenses in transit. If the off-car shrinkage of 10½ percent is interpolated to a fillback figure of 5 or 6 percent net shrinkage, the cost of moving these calves would be at least $2.00 per hundredweight. The fact the calves contracted shipping fever constituted an additional expense.

A breakdown of the transportation time and expenses is as follows:

Waybilled from White Sulphur Springs, Montana, on the White Sulphur Springs and Yellowstone Park Railway on October 19, 1951. Loaded at 4:30 p.m. 10/19/51 and unloaded Butte 12:30 p.m. 10/20/51. Reloaded on the Union Pacific Railroad, 8:00 p.m. 10/20/51 and unloaded in Ogden 12:15 a.m. 10/22/51. Reloaded Ogden 10:00 p.m. 10/23/51 and unloaded in Spanish Fork 10:45 a.m. 10/24/51.

The transportation charges were as follows:

1 - 36 ft. single deck with 40 head feeder calves	1600 @ 82½¢		$132.00	$1.79 (bedding)
36 hour release signed 36 ft. SD ordered and furnished	IC	6%	7.92	.11
			$139.92	$1.90
	Federal tax			4.25
	Total			$146.07
Same charges, etc. on second 36 ft. car	Total 2 cars			$292.14
1 - 36 ft. single deck trailer car containing 39 feeder calves	8000 @ 82½¢		$ 66.00	$1.79 (bedding)
	IC	6%	3.96	.11
			$ 69.96	$1.90
	Federal tax			2.16
	Total			$ 73.02
	Total transportation			$365.16

Feed, handling, and other charges:

Butte, Montana (per car)

Hay 400 lbs. @ $2.75 cwt.		$11.00
Service charges		.95
		$11.95
Federal tax		.03
		$11.98
Total $11.98 per car, 3 cars		$35.94

Ogden, Utah (per car)

Hay 600 lbs. @ $2.30 cwt.		$13.80
Yarding		1.00
Service charges		4.00
Bedding xx $1.79 ec .11		1.90
Federal tax		.21
Total		$210.43
Total feed, handling, and other charges		$246.17
Total all charges		$601.33

APPENDIX V

Another one of the interesting case studies on trucking methods in shrinkage and transit was made by California on their phase of the cost of marketing project. This case history is copied from the general summary of the California work to August 1, 1951. (8)

Case study

The day began at 4:00 a.m. April 13, 1951, and at 6:00 a.m. 420 heifers and 534 steers were driven about 1½ miles from a large stubble field to dry loading pens. (The animals had been on green alfalfa pasture.) They began to lead 23 trucks and trailers at 7:00 a.m. The first two trucks moved out at 7:20 a.m. and were weighed at Westmoreland at 7:30 a.m., 4 miles from the loading chute. These two trucks (Gaibaldi Trucking Company) left for Palmdale at 7:40 a.m. about a six-hour run where they were to meet two Chanley Brothers Transportation Company trucks which would take the loads on to Woodland.

At Palmdale the trucks met as scheduled at about 2:00 p.m. Chanley used the off weights for Garibaldi as their loading weights and departed for Woodland about 3:00 p.m. With the cooperation of the yard manager, the identity of each load was maintained for the remainder of the trip.

The first truck to arrive at Woodland Farms (12:30 a.m., April 14, 1951) had changed drivers at Bakersfield and the time of leaving Westmoreland was not available. I arrived before he had started to unload and the cattle were weighed off--with 16 of the trucks which arrived until 8:30 a.m. The last truck to load at the chute at 10:35 a.m. on April 13, 1951 arrived at Woodland Farms at 2:00 a.m. having left Westmoreland at 11:30 a.m. He made by far the fastest run and had one of the smaller shrinks. One truck had a serious mechanical failure and did not arrive until 10:30 a.m., April 14, 1951. Others had minor troubles or the drivers stopped to sleep or drivers were changed, etc., and thus the spread in the time of arrivals--10 hours.

The general condition of the cattle was better than that of the previous 800 and there were no death losses on the trip. One heifer was blind and not weighed at this end, and two steers were partly blind or crippled and not weighed on this end. The heifer will probably go to the vet college--the steers will be cured. The 954 were Washington cattle, which seemed to be better doers than the previous 800-from Arizona and New Mexico.

The data on the 16 individual loads weighed on arrival follow:

Number	Initial weight	Destination weight	Hours transit	Percent shrink
41	24,860	20,620	18	17.1
41	25,060	22,560	16	9.96
41	23,940	22,210	16.5	7.2
42	24,060	22,635	14.5	5.9
41	23,220	22,330	18	3.8
42	23,780	22,200	17	6.6
42	25,000	23,310	17	6.8
41	24,200	22,290	16	7.9
42	24,260	22,360	19	7.8
42	24,360	22,590	19	7.3
41	23,560	22,063	?	6.35
41	24,420	22,510	?	7.8
41	24,640	22,445	?	8.9
42	24,940	22,850	?	8.4
41	24,780	22,460	25	9.4
41	24,240	21,415	25	11.7
662	389,320	356,848		8.34

All 954 animals--heifers and steers--were shipped in 23 trucks and trailers and the total weight is available at the shipping point--563,040 pounds. After arrivals at Woodland, the off-truck were obtained for 16 of the trucks as shown above. However, all of the animals were weighed 1½ days after arrival, which would mean 36 hours. After being on pasture, the animals were separated before weighing on April 16, 1951 and the total weight was 545,775 pounds or a shrink of only 3.07 per cent. At this time the steers averaged 583.3 pounds, while the heifers averaged 557.9. The 545,775 pounds represents all animals shipped. If only the two steers were averaged in, the shrink would rise to 3.2 percent. If all three animals not weighed were averaged in, the shrink would be 3.4 percent.

Attention should be called to the wide variation in off-truck shrinkages. Shrinkage varied from 3.8 percent to 17.1 percent with an average of 8.34 percent. This study is evidence that considerable variation can be caused in the off-truck shrinkage by the way the individual truck driver drives his cattle. The cattle in the individual lots were gate cut from apparently uniform cattle, so considerable variation was caused in large parts by difference in truck drivers. This study is also a good example of what happened when grass cattle are hauled from grass to grass. These cattle showed a fill back from

5 percent of off-truck weights making their shrinkage a net of 3.4 percent. An example of where cattle are placed on nutritious feed of the same type after being transported that there is little difference in shrinkage in grass and feed lot cattle as far as shrinkage is concerned. This 3.4 percent net shrinkage is very comparable to the usual net shrinkage of fat cattle for the same period of time. The qualifying condition seeming to be that the feed must be nutritious and of a kind that the animal has been eating. A fill back period of 38 to 48 hours is necessary for the animal to resume normal eating habits.

APPENDIX VI

This is the case history of a truck load of cattle shipped from central Utah to Los Angeles and backhaul.

The purpose of the trip was to observe cattle trucking methods and to obtain accurate first-hand information on cattle shrinkage. The trucks observed were those of the King Truck Line. This particular line believes that livestock arrive at the market in much better shape when they are transported in enclosed and well ventilated trucks.

The load for this trip started on March 3 and was picked up at Manti, Utah. Weather and road conditions were poor. Because of snow, the King truck and trailer could not load at the country feedlot. As a consequence small bob-tailed trucks were used to bring the cattle 3 miles to Manti where they were weighed in the bob-tailed trucks and unloaded directly into the King truck and trailer, and the empty trucks were then weighed on the original scale.

The load of cattle consisted of 29 steers from one feedlot; 1 cow, and 3 heifers from another feedlot. The 29 steers weighed an average of 1,103 pounds or a gross weight of 31,987 pounds. These steers were hauled in three loads and were loaded between 12:00 noon and 1:30 p.m. The cow and the heifers were also loaded during that time. The cow weighed 1,130 pounds and the 3 heifers weighed 1,940 pounds. Pre-weighing feed information was not available for the cows and heifer, but the steers had been on feed for five months and had been receiving a ration of wheat and barley mixed, corn silage, and a mixture of wild and alfalfa hay. The animals were given a normal feed that morning

with free access to corn silage up to the time of loading. The trailer was well bedded with sawdust. The loaded truck left at 1:35 p.m.

Some time was lost during the trip because of a tire blowout. In St. George one steer was down which necessitated numerous stops during the remainder of the trip. A leaking water line caused overheating in the engine, another loss of time. During the trip the drivers alternated shifts every four hours.

The truck arrived in Los Angeles at 1:00 p.m. (MST) on March 4 and the cattle were unloaded and scaled by 1:30 p.m. The 29 steers weighed 29,390 pounds off-truck, a loss of 2,597 pounds or an off-truck shrinkage of 8.12 percent for the 24-hour run. The four females weighed 2,750 off-truck, a loss of 320 pounds or an off-truck shrinkage of 10.42 percent. After fillback records were not available on the female stock. However, the steers filled back 755 pounds in the 36 hours before they were sold with a net weight loss of 1,842 pounds or a net shrinkage of 5.75 percent. This net shrinkage of 5.75 percent is approximately 1.25 percent above the area average. The running time was 2 hours longer than the usual run.

After leaving the Los Angeles Stockyards, the truck headed north to Bakersfield for the night. The following morning after driving to Fresno, 18 tons of cottonseed meal were loaded. From Fresno the truck was driven to Sacramento where three purebred Angus heifers were loaded into the remaining space. The truck arrived in Layton, Utah, at 5:00 p.m. on March 6.

This cattle run may be regarded as typical of the shipments of this type to the Los Angeles market.

APPENDIX VII

Current Marketing Charges at Terminal Markets, Local Auctions, and Truck and Railroad Car Loadings by Size of Equipment

THE OGDEN UNION

STOCKYARDS COMPANY

TARIFF NO. 11

Cancels Tariff No. 10 and all Supplements and

Amendments Thereto

SCHEDULE OF CHARGES

FOR YARDAGE ON LIVESTOCK, SERVICE,

FEED, ETC.; RULES AND REGULATIONS

Section 1

Yardage Charges:

Yardage charges are as shown below, and will be assessed against and collected from the person, firm, or corporation selling, receiving, or handling the livestock at The Ogden Union Stockyards, subject to the exceptions below:

(1) On livestock received and/or sold at these Yards, also including livestock sold or resold through commission firms.

(2) On livestock sold in the country, weighing at these Yards for purpose of pro-rating back to the country weights.

(3) On livestock inspected, sorted, and/or diverted at or after leaving these Yards whether weighed at Ogden or not.

(4) On livestock consigned direct to packers and slaughterers.

Arriving by Rail, on Hoof, or Resold thru Commission Firms:

Cattle (except bulls)	$ .55 per head
Calves (under one year old and under 450 lbs.)	.36 per head
Pure Bred Bulls	1.75 per head
Bulls (except pure breds)	1.00 per head

Arriving by Vehicle other than Rail:

Cattle	$ .60 per head
Calves (under one year old and under 450 lbs.)	.39 per head
Pure Bred Bulls	1.75 per head
Bulls (except purebreds)	1.00 per head

Resold and/or Reweighed for Purpose of Sale, Except Commission Firms:

Cattle	$ .18 per head
Calves (under one year old and under 450 lbs.)	.13 per head
Pure Bred Bulls	1.00 per head
Bulls (except purebreds)	.36 per head

Livestock Consigned Direct to Packers or Slaughterers:

	Arriving by: Rail	Truck
Cattle	$.27½ per head	$.32½ per head
Calves (under one year and under 450 lbs)	.18 per head	.21 per head

Exceptions:

On livestock consigned to the Ogden market and offered for sale, but forwarded unsold to another market, the yardage charge will be waived.

On through shipments, handled for railroads and not sold, the yardage charge will be waived.

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* * * This charge of 11¢ per head will apply on first 200 head, on shipments from one consignor to one consignee for the same day's market.

SECTION 2

Feed, Feeding, Bedding, Etc.:

Prairie Hay (on fence)	$2.20 per cwt.
Prairie Hay (fed)	2.30 per cwt.
Alfalfa Hay (on fence)	2.20 per cwt.
Alfalfa Hay (fed)	2.30 per cwt.
(1) Bedding Straw	1.10 per bale

When feed other than the above is desired, it will be furnished if obtainable, by special arrangement.

When livestock is bedded or watered while in cars, a charge of $1.00 per deck will be made in addition to the regular charge for bedding or other material used.

When empty stock or box cars are bedded with hay or straw, a charge

of 55¢ per deck will be made in addition to the charge for hay or straw used.

On thru transit shipments of livestock, not offered for sale, stopped at Ogden at the request of the shipper or by the railroads in order to comply with the twenty-eight hour law, the amounts of hay ordered fed per car at one time will be charged for as follows:

200 lbs. (alfalfa or prairie hay).....	$2.60 per cwt.
300 lbs. (alfalfa or prairie hay).....	2.45 per cwt.
400 lbs. (alfalfa or prairie hay).....	2.30 per cwt.

(1) Hay may be furnished at the discretion of the Stockyards Company.

SECTION 3

Branding, Dehorning, Et Cetera:

Branding: Cattle, Calves, Horses, Mules -	
One iron-	$ .20 per head
Each additional iron	.05 per head
Dehorning and/or Tipping:	
Cows and Steers	$ .35 per head
Bulls and Stags	.45 per head
Ear Cropping:	.10 per head
Wattling:	.10 per head
Spraying and/or Dipping Hogs:	.10 per head

(a) Other operations such as castration, vaccination, immunization, et cetera, will be arranged for upon special request at reasonable rates plus fees of registered veterinarian when required.

(b) In case the owner desires to perform at his own expense the necessary labor incident to branding, dehorning, tipping, ear cropping, wattling, or otherwise operating upon cattle, calves, horses and/or mules, a charge of ten cents per head will be made for the use of facilities.

(c) This Company will not be responsible for any loss or damage incident to branding, marking, castrating, tipping, dehorning, etc., unless insured with the Company. The Company will insure any kind of livestock against death for one per cent of the declared value in addition to the above charges. In the event insurance is desired, declaration of value and desire of insurance must be made when order is placed.

SECTION 4

Disinfecting Charges:

Whenever the Bureau of Animal Industry of the United States Department of Agriculture or other governmental authority deems it necessary

to disinfect any portion of this Company's yards, or freight cars, or stock wagons or stock trucks, the following charges will be assessed and collected from the owner of such infected stock responsible for the necessity thereof:

Pens, Single Load	$5.00 each
Pens, Double Load	8.00 each
Chutes	5.00 each
Alleys and runways	Same proportion as pens
Stock Cars	5.00 per car
Stock Trucks or Trailers	5.00 per truck

Unloading and Reloading Charges, All Tariffs (5)

Charges are per deck

From / To	Country Loading Point	Public Stockyards Markets	Private Stockyards at Public Market Point	When Shipper Specifies Feed Point, or Stop is Made to Try a Market or to Comply with Quarantines
Country Receiving Point.....	83¢	None	None	83¢
Public Stock Yards Market	None	None	None	83¢
Private Stock Yards at Public Market Point...	None	None	None	83¢
Public Stock Yards Market under P. and S.	None	None	None	83¢

Tariff published charges: (5)

	S. D.	D. D.
Feeding service charge	$0.92	$1.83
Unloading and reloading	.83	1.66
Bedding	1.83	2.72
Cleaning and disinfecting	4.55	7.21
Cleaning and disinfecting - each loading chute		1.83
Cleaning and disinfecting - each alleyway		3.63
Cleaning and disinfecting - each pen		9.10

Instructions as to the Feeding of Livestock in Transit

1. Order of precedence of feeding instructions:

   (a) Instructions of owner, shipper or caretaker accompanying the livestock, verbally or in writing. Written instructions or a confirmation of verbal instructions should be secured in writing if possible.

   (b) Instructions as written on the livestock contract and/or waybills.

   (c) Standing instructions as issued in a circular or supplements thereto and on file with the railroad.

2. On any shipments where there are no feeding instructions of any nature, only the amount of feed as prescribed in the U. S. D. A. Statement of Policy and Recommendations as issued November 22, 1949 and quoted herewith shall be fed, except when livestock is confined in feed yards beyond a reasonable time (approximately twelve (12) hours). In such cases, necessity for additional feeding should be discussed with Union Pacific Agent and be furnished as authorized by him.

3. The U. S. Department of Agriculture issued a Statement of Policy made effective November 22, 1949:

   "It is the view of the Department of Agriculture that the feeding, watering and resting of livestock in the course of transportation by railroad when in accordance with the recommendations set out herein will meet the requirements of the 28 hour law.

   "Amount of feed.

   (a) Under normal conditions, the amount of feed designated in the following schedule will be considered as sustaining rations for livestock in transit when fed at the intervals required by the Twenty-Eight Hour Law:

Species and Quantity of Livestock	At First Feeding Station	At Second and Subsequent Feeding Stations
Cattle and Beef Type or Range Calves (for each car)	200 lbs. of hay*	300 lbs. of hay *
Dairy Calves (for each car deck)	100 lbs. of hay*	150 lbs. of hay *

* Or the equivalent in other suitable feed. Dairy calves too young to eat hay or grain, or shipped without their dams, should be given a sufficient amount of prepared calf feed, milk, raw eggs, or other suitable feed. All feed should be of good quality.

"(b) When the owner of a consignment of livestock desires that they be fed larger amounts of feed than those designated in paragraph 3 (a) for the particular kind and quantity of livestock, or the carrier believes that they should be fed larger amounts, the amounts to be fed should be agreed upon, if practicable, by the owner and the carrier at the time the animals are offered for shipment.

"(c) When emergency conditions arise, such as severe changes in the weather, which increase the rigors of transportation, the livestock should receive amounts of feed, additional to those designated in paragraph 3 (a), sufficient to sustain them until they arrive at the next feeding station or destination.

"(d) When the movement of livestock is delayed enroute so that the period of their confinement in the cars materially exceeds that limited by the Twenty-Eight Hour Law, the livestock should receive additional feed in proportion to such excess time.

"Two or more feedings at same station. When livestock are held at a feeding station 12 hours after the last previous feed has been substantially consumed, they should again be fed the ration prescribed by paragraph 3 (a) for that station: Provided, however, that they may be held without such feeding for a period longer than 12 hours if the time they are so held, added to the time required to reach the next feeding stations or destination, whichever is closer, would not ordinarily exceed 40 hours."

Yardage Charges in Effect September 1, 1950, at Various Western Terminal Livestock Markets. (5)

Public Market	Charge per Head via Rail		Charge per Head via Truck	
	Cattle	Calves	Cattle	Calves
Omaha	75¢	42¢	75¢	42¢
St. Joseph	67¢	44¢	67¢	44¢
Kansas City	75¢	45¢	75¢	45¢
Denver	60¢	29¢	67¢	44¢
Sioux City	65¢	38¢	65¢	38¢
Salt Lake	45¢	33¢	50¢	36¢
Ogden	55¢	36¢	60¢	39¢
Spokane	65¢	40¢	65¢	40¢
Los Angeles	65¢	42¢	70¢	47¢
San Francisco	65¢	42¢	65¢	42¢
Portland	60¢	35¢	60¢	35¢
Seattle	60¢	35¢	60¢	35¢

Appendix table 6. Usual cattle auction fees at Utah auction

Cattle up to 400 pounds	$ 1.50
Cattle over 400 pounds	2.00
Mature bulls	2.50
No sale same as sale	
Veterinarian fees	Cost

Appendix table 7. A copy of: Table 1, Number of Animals for Safe Loading in Trucks, All 8-Foot Widths, Cattle per Truck (5)

Average Weight, Lbs. Length	700	800	900	1000	1100
13-ft. truck	11	10	9	8	7
16-ft. truck	14	13	12	11	10
20-ft. truck	18	16	15	13	12
24-ft. truck	22	20	18	16	15

Appendix table 8. A copy of: Table II, Recommended by the National Live Stock Loss Prevention Board and the Western Weighing and Inspection Bureau. (5)

	Cattle per car											
Average Weight	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
36-ft. car	60	50	42	37	33	30	27	25	23	22	21	19
40-ft. car	67	56	46	40	37	33	30	27	25	23	22	21

Tariffs prescribe:	Length of Car	
Minimum Weights on	36' 6"	40' 6"
Calves, Single Deck	16,000 lbs.	17,700 lbs.
Double Deck	23,000 lbs.	25,500 lbs.
Cattle	*22,000 lbs.	*24,400 lbs.

* West of the Rocky Mountains minimums on cattle are 24,000 lbs. for 36' 6" cars and 26,600 for 40' 6" cars.

APPENDIX VIII

Schedules used in collecting shrinkage and other marketing data

UTAH STATE AGRICULTURAL COLLEGE EXPERIMENT STATION
Department of Agricultural Economics

SHRINK AND COST OF MARKETING LIVESTOCK* Record No._____

Shipper_____ Address_____ County_____

Kind of livestock: Cattle_____, Sheep_____, Hogs_____

Shrinkage Experience by Channel

Item	Channel Number								
	1	2	3	4	5	6	7	8	9
Class of Livestock									
Number of Head (est.)									
Average Weight									
Slaughter or Feeder									
Point of Origin									
Destination									
Usual Lot Size									
Rail* - Truck**									
Usual time involved (hrs.)									
Shrinkage off car (Minimum									
(Average									
(Maximum									
Shrinkage after fill (Minimum									
(Average									
(Maximum									
Usual Shipping Season									

General Information:

1. When does most of shrinkage occur?_____
2. What percent of the total shrinkage takes place in that period of time?_____
3. Describe unusual feed and other conditions that lead to high shrinkage_____
4. What influence has weather conditions or time of year on shrinkage?_____
5. What are your major marketing problem(s)?_____
6. Your recommendation(s) for improvement are:_____

*Based on experience shipper has had moving livestock.

Costs and Handling for Usual Channel

Record No._____
Channel No._____

1. What are your usual pre-weighing conditions?_____

2. Describe usual terms of sale (shrink allowance, stand, distance hauled to weighing, etc)_____

3. Usual marketing costs (feed in transit and at destination, commissions, insurance, etc)_____

4. Usual handling at destination or point of sale_____

5. Transportation Costs: Rail $_____ per head; $_____ per cwt.
Truck $_____ per head; $_____ per cwt.

Did you have any freight or other benefits? If so, describe_____

6. Usual Yearly losses:

(a) Loss by death in transit: No._____ Weight_____(lbs) Est.Value $_____

Apparent causes_____
(b) At the Market: No._____ Weight_____(lbs) Est. Value $_____
Apparent causes_____
(c) Loss by crippling in transit: No._____ Weight_____(lbs) Est.Value $_____
Apparent causes_____
(d) Other losses (shipping fever, etc)_____

FIELD NOTES OR COMMENTS_____

..... AGRICULTURAL EXPERIMENT STATION Deal No.....

NAME OF SHIPPER ..... Address.....

Number, Class, Breed and Kind of Cattle:

Number in shipment: Calves ..... Heifers ..... Steers ..... Wet Cows ..... Dry Cows ..... Other .....

Indicate kind by check: Slaughter ..... Feeder ..... Stocker .....

Indicate breed with check: Hereford ..... Shorthorn ..... Dairy ..... Crossbred ..... Angus .....

Handling and Feeding Prior to Initial Weighing:

A. Feed used prior to weighing (check appropriate line and column)

Kind of Feed	12 hours prior	12 to 48 hours	2 to 7 days	More than 7 days prior
Dry range				
Green pasture				
Pasture and grain				
Dry lot feed				
Off feed and water				
Other				

B. 1. If calf shipment—were calves cut from mothers and weighed immediately? yes..... no.....

2. How long prior to shipment were they off mothers? ..... days.

C. Movement to scales and/or loading point

2. Miles by truck ....., cost $..... Total hours off feed before weighing .....

Miles by truck ....., cost $..... Total hours off water before weighing .....

Initial Weighing:

A. Place weighed ....., date and hour weighed....., date last scale inspection .....

B. Hours elapsed between weighing and loading . . . .gross weight at shipping point.....

Movement of Livestock from Initial Weighing Point to Destination:

A. Method of transportation: rail....., truck ....., cost per cwt. $....., or total $.....

B. Destination ....., miles....., hours in transit.....

C. If livestock were fed and watered in transit, give the following data when available:

Place	Hours rest and feed	Cost of feed & handling	Off car weight	On car weight

Handling at Destination:

A. Date and hour unloaded ....., off car weight....., to whom consigned .....

B. Date and hour of sale ....., sale weight....., sale price $.....

C. Were livestock fed and watered at market? yes....., no.....

Expenses Paid at Market for this Shipment:

Yardage $....., commission $....., feed $....., insurance $....., other..... Total.....

Explain any Unusual Weather, Feed, Water or Handling Conditions that could Affect Shrinkage of Shipment: (If additional space is needed please use back of schedule.)

A. At ranch .....

B. At shipping point, if not at ranch .....

C. In transit .....

D. At market .....

E. Other comments .....

If Livestock Were Sold on Contract Prior to Delivery, List Contract Terms:

A. Percentage shrink ....., hours off feed and water ....., miles driven .....

B. Contract price $....., down payment $....., date of contract .....

Grade and Yield of Slaughter Livestock:

A. Estimated live grade
1. No. choice .....
2. No. good .....
3. No. medium .....
4. No. ....

B. Actual carcass grade
1. No. choice .....
2. No. good .....
3. No. utility .....
4. No. ....

C. Estimated yield .....%

D. Actual yield .....%

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