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ARTHUR GRANT BOVAY

Shrinkage Of Live Stock In Transit

Thesis For Degree Of M. S.

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Shrinkage of Live Stock in Transit

Shrinkage as referred to in this narrative means the net loss in weight resulting in shipping live stock from loading stations to the market, or the difference between weight at the loading stations and the hoof or sales weight at the market. A normal shrinkage is to be expected and an excessive fill resulting in waste of feed and possible discount in the market prices is to be avoided.

The subject of shrinkage has been given special attention because it is one of the factors in marketing live stock on which information is in greatest demand. The lack of scale facilities at many of the shipping stations prevented obtaining the necessary loading weights needed to determine the net shrinkage or fill at market on shipments originating at such stations. In other instances, where loading weights were obtained, the shippers failed to furnish the sales weight at market. Inasmuch as it was impracticable to follow many of the cattle shipments to market, information was obtained from shippers and their records.

.Territory Covered

Records obtained on the cost of marketing cattle were first begun in the Flint Hills section of Kansas and the Osage Nation in Oklahoma, which are districts where cattle are finished on grass and marketed in the late summer and early fall. The lack of scale facilities at many of the loading stations, especially in Oklahoma, prevented, in a number of instances, obtaining loading weights needed to determine the shrinkage or fill resulting from shipping the stock to market. When the work was extended to the grazing sections of western Nebraska, Montana, Wyoming, the Dakotas, and Colorado, scale facilities

were found to be limited there also. Another factor which discourages the practice of weighing at loading stations in the western range states is the size of the shipments usually sent to market. In Montana and Wyoming, for instance, it often is necessary to drive cattle from 50 to 125 miles to a shipping station after they have been rounded up on the range, and the droves thus collected usually are of such size as to require a full train to transport them to market. The task of weighing several cars of cattle when the scales will not accommodate a full carload, is not only laborious but requires considerable time which very few shippers like to spare in their desire to get their stock loaded as quickly as possible.

When the investigation was extended to those states where cattle are finished in feed lots, better weighing facilities were found and complete records were more easily obtained. Altogether, complete records were obtained on 79 cars of steers, 49 cars of cattle of mixed classes and grades, and 35 cars of pulp-fed cattle, the latter being shipped from feed lots in the best sugar districts of eastern Colorado and western Nebraska. The shipment of steers and mixed cattle originated in the following states:

State of origin	STEERS Shipments	Cars	State of origin	MIXED CATTLE Shipments	Cars
Ohio	17	26	Illinois	17	19
Missouri	14	25	Missouri	9	11
Illinois	8	10	Ohio	9	9
Indiana	4	4	Iowa	3	3
Tennessee	4	4	Indiana	2	2
South Dakota	1	3	South Dakota	1	2
Kentucky	1	2	Michigan	1	1
Nebraska	1	2	Minnesota	1	1
Kansas	1	1	Wisconsin	1	1
Michigan	1	1			
Mississippi	1	1			
Total	53	79	Total	44	49

Practically all these shipments were feed-lot cattle or

native cattle, as distinguished from range or western cattle. The data on these shipments were segregated for comparison into three groups, straight carloads of steers, cars of mixed classes and grades, and shipments of pulp-fed cattle from the sugar beet districts of Colorado and Nebraska. The data on the steers and mixed stock have been assembled in tabular form on the basis of the size of load, based on weight. All cars weighing less than 20,000 pounds were segregated into the first group. Other groups were created for each additional 4000 pounds of weight added.

Table 5 show the net shrinkage per hundredweight of stock resulting from shipping the animals to market. The steers were of fairly uniform weight, ranging from an average of 1040 pounds, to 1223 pounds at the market, the grand average being 1113 pounds. The sizes of loads based on the number of animals to the car were quite uniform, the average for the different groups varying from 17 in the lightest loads to 24 in the heaviest, with an average of 21 for all cars studied. The least shrinkage took place in the lightest loads, and with this exception the amount of shrinkage did not seem to be affected by size of load based on weight, the maximum variation being less than .2 per cent. The average shrinkage for all the shipments was 4.2 per cent, or 40 pounds for a thousand-pound steer.

In the mixed classes and grades of cattle, with one exception, the average weight of the animals was almost as uniform as in the case of the steers, ranging from 738 to 887 pounds. The one exception was a group of six cars which averaged 1136 pounds per animal. The grand average for all cars of mixed stock was 883 lbs. In this group the heaviest shrinkage took place in the lightest and the heaviest loads, the latter shrinkage most. Those loads ranging in weight from 20,000 to 28,000 pounds, suffered an average shrink of approximately 3.9

TABLE 5 - Showing relation of weight of load to shrinkage, incurred in marketing steers and mixed classes and grades of cattle at centralized markets.

Classes of Cattle	No of Cars	Av. No. head to Car	Av. length of haul miles	Av. Car loading weight Lbs.	Av. Car sales weight Lbs.	Av. sales wt of cattle Lbs.	Av. shrinkage per cwt. Lbs.
	5	17	238	18,019	17,478	1,040	-3.00
	31	21	182	21,661	20,771	1,144	-4.11
Steers:	29	20	265	25,905	24,872	1,223	-3.99
	14	24	218	29,892	28,651	1,176	-4.15
							-4.02
Average	79	21	223	24,447	23,465	1,113	
Mixed:	9	22	117	17,223	16,490	738	-4.25
classes	21	24	179	21,876	21,029	887	-3.88
and	13	29	190	26,135	25,125	855	-3.87
Grades:	6	25	186	29,988	28,215	1,136	-5.91
Average	49	25	172	23,145	22,161	883	-4.25

pounds per cwt., or 39 pounds, for a thousand-pound animal. The average number of animals loaded per car was quite uniform in this group also, ranging from 22 to 29 and averaging 25 for the entire group.

Minimum carload weights for cattle are obtained easily in shipping cattle, as shown in the average weights of the loads studied. In fact, it is easy to exceed the minimum weight allowance for cattle without undue crowding. Reference is made elsewhere to the difficulty of loading hogs and sheep to the present minimum weight allowance for these animals. The average shrinkage on the steers totalled 44¾ lbs., and on the mixed classes and grades 37½ pounds per animal. This loss in weight measured by the market price of the stock amounts to a considerable sum, and shippers in consigning stock to centralized markets give this matter serious consideration, inasmuch as the amount of shrinkage often determines their profit or loss.

Table 6 is a summary of the data showing net shrinkage incurred in marketing pulp-fed cattle from western Nebraska and western Colorado. The first three shipments originated in the latter state, two of them originating at the same loading station. The two Nebraska shipments also originated at the same station.

The average weight of the cattle in three of the shipments was quite uniform, ranging from 1025 to 1043 pounds at the market. The other two shipments averaged 975 and 1420 pounds per animal. The lighter cattle suffered the heaviest shrink, averaging 6.65 pounds per cwt. While one shipment shrunk 2.15 per cent, the amount of shrinkage on the other three shipments was approximately the same, being slightly over three per cent. The average car sales weight ranged from 22,550 to 24,972 pounds. the shipment with the maximum weight being loaded with the lightest weight cattle. The average

number of cattle loaded per car ranged from 17 of the heavy kind to 25 of the light weights, the average for all shipments being 22.

Table 6 - Summary showing net shrinkage incurred in marketing pulp-fed cattle from sugar beet districts of Colorado and Nebraska.

No. of cars	Av. no. of cattle per car	Length of haul	Av. car loading weight	Av. car sales weight	Av. sales weight per animal	Shrinkage per cwt.
		miles	Lbs.	Lbs.	Lbs.	Lbs.
12	25	660	26,560	24,792	975	-6.65
4	22	517	23,046	22,550	1,025	-2.15
4	22	579	23,685	22,958	1,043	-3.07
7	17-	563	24,679	23,931	1,420	-3.03
8	22-	563	23,293	22,568	1,038	-3.11
Av.35	22-	593	24,707	23,645	1,071	-4.30

Results of Other Shrinkage Investigations.

As a supplement to the data obtained on shrinkage of cattle, reference is made to the results obtained in an investigation made by the Bureau of Animal Industry. The Bureau made quite an exhaustive study of shrinkage of range cattle shipped from the southwestern and northwestern range states to centralized markets in 1910 and 1911. In addition data were obtained on the shrinkage of feedlot cattle shipped from Oklahoma, Iowa and Illinois in 1911 and 1912. The results of this investigation were published in Department Bulletin 25, "The Shrinkage in Weight of Beef Cattle in Transit," and Tables 1, 2, and 3 are summaries of the data appearing in the bulletin.

Table 1 is the summary of the data obtained during the summer and fall of 1910, and winter and early spring of 1911. Data on nearly 6000 head of cattle are included in this table. The year i which the work was done was a very dry one, with little grass, and was conducive to a poor fill at origin and a small shrink in transit for range cattle. With two exceptions the weather was good when all the shipments of range cattle were moving to market. Two shipments which were destined to Kansas City were caught in snowstorms and their shrinkage was heavy when compared with the other shipments. The variations in the net shrinkages were quite wide for the different shipments. The greatest variation was found with the mixed range cattle in transit less than 36 hours, and the next greatest with range cows. The difference was not so great with the calves nor with the fed cattle. The variation was greater with the fed cattle which were in transit over 36 hours than with those in transit for a shorter period. The average net shrinkage for all of the range cattle was small.

TABLE 1 - Summary showing net shrinkage resulting in shipping range cattle and cottonseed-meal fed steers from southwestern states to centralized markets, 1910-1911.

Description of shipments.	No. of shipments	No. of cattle	Average weight at origin	Net Shrinkage		Ratio of shrinkage to live weight at origin
				Range	Average	
			Lbs.	Lbs.	Lbs.	Per Cent
Range calves in transit less than 36 hours	8	859	166	+14-13	+3	+1.8
Range calves in transit over 36 hours	5	475	209	+9-0	+4	+1.9
Range cows in transit less than 36 hours	8	509	749	+12-40	-14	-1.9
Mixed range cattle in transit less than 36 hours	9	791	589	+12-50	-3	-0.5
Mixed range cattle in transit 36 to 72 hours (1)	7	1,310	575	+27-3	+3	+0.5
Mixed range cattle in transit 105 hours	2	588	541	-7-42	-38	-7.0
Cottonseed-meal-fed steers in transit less than 36 hours	4	680	1,266	-41-67	-57	-4.5
Cottonseed-meal-fed steers in transit over 36 hours	6	616	862	-47-73	-59	-6.8

(1) Cattle were in transit 54 to 72 hours, but the figures are for the second portion of the journey, and not for the total time in transit.

It will be noted from a study of Table 1 that the range calves took on a fill instead of a shrink, also that the range cows and mixed range cattle had a very slight shrink. The heavy shrinkage on the mixed range cattle in transit 105 hours was due to one of these shipments being in a snowstorm four days, and at one of the stations where they were unloaded for feed and water the water pipes were frozen so that they obtained very little water. The fact that these range cattle were shipped in a season of drought from pastures where there was very little grass and water undoubtedly tended to cause a very light net shrinkage at the market. On the other hand, the cottonseed-meal-fed steers were shipped under more normal conditions, with the result that the net shrinkage was greater. These fed cattle were shipped from feedlots in Oklahoma to Kansas City and St. Louis and with the exception of one shipment which arrived at market during a raging b blizzard, weather conditions were very good. The data received on these cottonseed-meal-fed shipments indicated very clearly that the gre greater part of the shrinkage on the cattle occurred during the first 24 hours of the shrink.

Table 2 is a summary of the results obtained in shipping range and feedlot cattle from the northwestern states to the centralized markets during the season of 1911-1912. The range cattle originated in Wyoming, Montana, and Western Nebraska, and were sent to market from September to December. The shipments of fed cattle originated in Iowa and Illinois, the work being finished in the latter state in June 1912. The net shrinkage on all the cattle was very uniform. The data indicate that the greatest shrinkage occurs during the first portion of the journey. The work during 1911 and 1912 was conducted under more normal weather conditions than that conducted in the pre-

TABLE 2 - Summary showing net shrinkage resulting in shipping range cattle and feed-lot cattle from northwestern states to centralized markets, 1911-1912.

Description of Shipments	No. of ship-ments	No. of cattle	Average weight at origin Lbs.	Net shrinkage Range	Net shrinkage Average	Ratio of net shrinkage to live weight at origin
						Per cetn
Mixed range cattle in transit less than 36 hours	16	866	909	-35-114	58	-6.38
Mixed range cattle in transit 36 to 72 hours	11	794	978	+1-54	36	-3.68
Mixed range cattle in transit over 72 hours	8	695	1,030	-12-97	53	-5.00
Mixed corn-fed cattle in transit less than 26 hours	6	278	1,218	-20-78	51	-4.19
Mixed corn-fed cattle in transit 26 to 30 hours	38	1,209	1,214	-9-123	51	-4.20
Mixed corn-fed cattle in transit 30 to 36 hours	19	527	1,086	-18-88	45	-4.15
Silage-fed cattle in transit less than 20 hours	7	397	1,232	+7-67	(a)23	-1.87
Silage-fed cattle in transit over 20 hours	11	438	1,121	-7-75	32	-2.85

(a) This average is unusually low because of one shipment of 107 head which actually gained 7 pounds per head after the fill at market. If thisshipment is left out the average net shrinkage of the remaining 290 is raised to 30 pounds.

vious season in the southwestern states. The range cattle from the northwest were marketed while the weather was good and conditions were favorable for keeping shrinkage to the minimum. The fed cattle which were shipped later went to market when weather conditions were more severe. Some of the shipments experienced extremely severe weather at the market. The data shown in Table 2 on fed cattle is more comparable with that obtained in the investigation reported herein, and it will be noted that in both investigations there is little variation in the average percentage of shrink, the average being slightly more than four per cent.

Table 3 represents a summary of work conducted in 1911 to supplement the other investigation made. Approximately 5000 animals were weighed in sucuring the data shown in this table, and the results are a good indication of the shrinkage to be expected during a normal season. It iwll be noted that there was a considerable variation in the net shrinkage especially in those shipments from the northwest. The cattle shipments from that section originated in Montana and Western South Dakota. Those from the Southwest originated in Texas. Frequent rains had fallen in Texas during the winter of 1910 and 1911 and good grass was abundant the following summer. The grazing season of 1911 was about a normal one and the results obtained from the shrinkage work that fall may be taken as an average. The cattle were either in good flesh or fat. Most of the range cattle are driven any where from one to upwards of a hundred miles to the railroad for shipping, and as a rule they are driven from fifteen to twenty miles each day and then grazed along the trail for a few hours, and this procedure is kept up until shipping pens are reached. It is very seldom that range cattle are fed on arrival at the shipping pens before loading, and in many cases they are allowed little, if any, water. Hay is seldom placed in the cars for the stock to eat while in transit. As a result of this

TABLE 3 - Summary showing net shrinkage resulting in shipping range cattle from northwestern and southwestern states, 1911.

Description of Shipments	No. of ship-ments	No. of cattle	Average weight at origin	Net shrinkage		Ratio of shrinkage to live weight at origin
				Range	Avg.	
			Lbs.	Lbs.	Lbs.	Per cent.
Southwestern range calves en route less than 36 hours	3	211	246	-11-13	12	4.9
Northwestern range steers en route over 36 hours	5	730	1,193	-65-33	70	6.0
Southwestern range cows en route less than 24 hours.	8	1,307	860	-26-60	34	4.0
Southwestern range cows en route 24 to 36 hours	17	1,383	907	-4-64	32	3.6
Northwestern range cows en route over 36 hours	3	126	1,020	-50-72	61	6.0
Southwestern mixed range cattle en route less than 24 hours	13	849	783	-2-71	26	3.3
Southwestern mixed range cattle en route 24 to 36 hours	5	150	751	-19-75	42	5.6
Northwestern mixed range cattle en route over 36 hours	4	180	1,066	-14-32	21	2.0

treatment range cattle have undergone considerable shrink by the time they are loaded on cars at the shipping stations.

Among the conclusions reached in the investigation conducted by the Bureau of Animal Industry was that the shrinkage of range cattle in transit over 70 hours during a normal year is from 5 to 6 per cent of their live weight. If they are in transit 36 hours or less the shrinkage will range from 3 to 4 per cent of their live weight. Also, the shrinkage of fed cattle does not differ greatly from that of range cattle for equal periods of time. It varies from about 3 per cent with all of the silage-fed cattle and 4.2 per cent with the corn-fed cattle, when both classes of these animals were in transit for less than 36 hours, to 5.4 per cent for the pulp-fed cattle which were in transit from 60 to 120 hours.

SHEEP

Methods of Marketing

A summary of the replies of the special live stock and price reporters of the Bureau of Agricultural Economics of the U. S. Department of Agriculture to a schedule of questions relative to the methods of marketing practiced throughout the United States published in Report 113, Office of the Secretary, shows that from 35 to 90 per cent of the sheep marketed in the different sections are shipped to market, that from 10 to 50 per cent are sold to local butchers and packers, and that from one to ten per cent are sold in the carcass or marketed otherwise. In addition it is shown that the practice of shipping to centralized markets prevails most generally in the central states, and that the greatest prevalence of local marketing is found in the extreme eastern, western, and southern sections. These comparisons represent relative proportions and not actual numbers of arrivals marketed from the various sections. Comparing one class of animals with another in the same group of states it was found in all sections except the cotton states that sheep show the largest proportion shipped in carload lots by growers. In fact, the proportion of sheep marketed by owners leads to the conclusion that the majority of sheep producers are large scale growers or feeders who handle stock in such numbers as to permit marketing in carload lots.

The data used here were collected on shipments originating in Colorado, Illinois, Kansas, Michigan, Missouri, Montana, Ohio, and Wyoming. With the exception of Kansas, from 58.9 to 74.5 per cent of the sheep marketed from the central states in this group are sold to regular local dealers for shipment to market. (1)

(1) Report 113, Office of the Secretary.

Kansas sheepmen market 30.9 per cent of their marketable sheep thru local dealers and ship 61.2 per cent in carload lots. The proportion of direct shipments in carload lots in the other four central states where data on sheep marketing were collected varies from 6.3 per cent in Ohio to 35.9 per cent in Illinois. In the former state ten per cent of the sheep are sold to local butchers for the retail market trade. In Michigan 20.5 per cent are marketed in this way.

In the three western states in which data were obtained on cost of marketing sheep, the percentage shipped direct in carload lots ranged from 65.8 per cent in Colorado to 85.2 per cent in Wyoming. In the former state 23.8 per cent of the sheep marketed are sold for shipment to feeding points as compared with eight per cent thus sold in Montana and seven per cent in Wyoming. Montana sheepmen dispose of 8.4 per cent of their marketing sheep thru local dealers and ten per cent are bought by local butchers for retail trade.

Information from various sources indicates that four-fifths of the sheep and lambs marketed in the United States pass thru the large central markets while only one-eighth are sold for local slaughter and from three to four per cent are slaughtered on farms and ranges.

The replies of the special live stock and price reporters of the Bureau of Agricultural Economics relative to the numbers of feeder sheep and lambs bought in the different seasons show that fall buying is most prevalent. (1) Figures for the cornbelt states, with those for the two sheep-feeding states of Michigan and Ohio added, show that 65 per cent of the stocker and feeder sheep are bought in the fall. The replies further show that the stockmen of these areas buy 47 per cent of their feed-lot supplies at the centralized markets.

(1) Report 113, Office of the Secretary.

Data received from railroad division superintendents show that the big movement of sheep and lambs to feed lots taken place from the latter part of September to the first part of December. Kentucky, Missouri and Texas buy a large percentage of their stocker and feeder lambs in the summber months.

The surplus-producing mutton states ship large numbers in the fall, which makes this the heavy marketing season for sheep. It is estimated that these states market 62 per cent of their sheep and lambs during the fall months. The sheep-feeding sections of the United States tend toward selling in the summer, with the exception of those few states which make a specialty of shipping spring lambs. Lambs from the feed lots of Colorado and Nebraska are sent to market from February to June.

Basis for Data

~~Costs of Marketing~~

Records were obtained on shipments comprising 11 single and 43 double-deck cars. These records have been summarized according to states of origin in Table 7. Presented in this form it is possible to compare the shrinkage of sheep in the Corn Belt and in the sheep-feeding states of the North-Central states with the shrinkage on them from the western sheep-producing states. The lack of scale facilities at many sheep loading stations prevented getting loading weights needed in determining shrinkage in transit, thus accounting for the small number of records used in the comparisons.

Eleven shipments comprising three single and ten double-deck cars on which records were obtained, originated in Ohio. The three single-deck cars and two double-decks were marketed at Pittsburgh, while seven double-decks were sent to Buffalo. The other double-deck was billed to Cleveland. The length of haul for all the Ohio ship-

Table 7 * Summary showing net shrinkage incurred in marketing sheep and lambs at centralized markets.

State of origin	No. of decks	Av. no. animals per deck	Av. Length of haul	Av. loading wt.	Av. sales wt.	Av. shrink per cwt.
			Miles	Lbs.	Lbs.	Lbs.
Ohio	23	111	300	9,908	9,068	8.48
Missouri	6	115	157	9,158	8,374	8.57
Illinois	18	112	404	9,381	9,026	8.15
Michigan	2	107	385	8,655	7,950	8.15
Kansas	4	125	91	10,170	9,565	5.95
Montana	16	114	1113	-----	10,150	----
Colorado	10	117	694	11,381	10,760	5.45
Wyoming	18	126	120	12,610	12,165	3.53

ments ranged from 170 to 366 miles. A record of the time in transit was obtained only in five shipments, and with the exception of 27 hours for ths shortest haul the time ranged from 50 to 61 hours. The only explanation to be offered for such a long period of time being required to transport these cars to market is that not enough cars of stock originate in Ohio to justify special live stock trains such as are furnished further west, consequently practically all shipments of live stock originating in that state go in mixed freight trains.

Withe the exception of one mixed single-deck car of lambs and sheep, all of the shipments originating in Ohio consisted of lambs and the number loaded per deck ranged from 100 to 116, averaging 110. The same weight per deck for these lambs ranged from 7,700 to 9,513 pounds, averaging 8,911 pounds. Minimum carload weights allowed for sheep range from 12,000 to 14,000 pounds for single-deck cars and 18,000 to 23,000 pounds for double-deck cars. The maximum weight recorded on a double-deck car in the reports obtained on Ohio shipments was 41,800 pounds on two cars at the loading station, which is an average of 20,900 pounds per car. These cars weighed 38,050 pounds, or an average of 19,025 pounds each at the market. The maximum weight on a single-deck car was 10,850 pounds at loading station and 10,100 pounds at the market. While it is possible to attain the minimum weight allowance for double-deck cars in loading sheep, especially for the lower weight allowances, it is practically impossible to do so in loading single-deck cars without undue crowding, which would increase the risk of injury and loss in shipping.

Shrinkage is affected by so many factors that it necessarily varies widely. This is verified by the data on the Ohio shipments of sheep where it will be noted that the shrinkage from loading station to market ranged from 5.6 per cent to 12.09 per cent. It is impossible

to explain why some loads had a greater shrinkage than others, especially when one of the most important factors, (1) length of time in transit, is unknown in some of the shipments.

By averaging the data on shrinkage in a great number of shipments a fair idea of the shrinkage to be expected under average conditions in a given section may be obtained, but it must be understood that for individual shipments a wide fluctuation from the normal can be expected. The figure on shrinkage appearing in Table 7 must be taken for their respective values based on the number of shipments used the averages.

The six cars of sheep originating in Missouri shown in Table 7 were all single-deck cars, and, with the exception of two cars of mixed sheep and lambs, all were lambs. The number of animals per car ranged from 88 to 135, average being 115. All of the shipments were marketed at National Stock Yards, Illinois, and the length of haul varied from 125 to 177 miles. The time en route ranged from 11 to 19 hours, the average being 17 hours. There was a wide range in the weight of the loads, the minimum at the market being 5,880 pounds, and the maximum 10,410 pounds, and in this instance both loads originated at the same loading station.

The net shrinkage on four cars was quite uniform, being approximately 8.75 pounds per cwt. The other two cars had a shrinkage of 6.39 and 10.77 per cent, and the greater shrinkage occurred in the lightest load which consisted of 88 mixed lambs and old sheep. It is of interest to note that with the exception of the loads of sheep originating in Kansas the average net shrinkage on the sheep loaded in each of the central states where data were obtained ranged from 8.15 to 8.57 per cent.

(1) See Table 14A Page 30A

The shipments of sheep originating in Illinois on which data were collected consisted of 8 double-deck cars consigned from Chicago to Pittsburgh, and two local shipments, both single-deck cars, one of which went to Chicago and the other to Indianapolis. The only information obtained on the shipments originating in Chicago was the weights at loading and destination, which made it possible to calculate the net shrinkage resulting. This shrinkage varied from 1.00 to 3.91 per cent and averaged 3.55 per cent. The low shrinkage one these shipments was very likely due to the sheep receiving a good shrink while en route to Chicago from the original loading station. The shrinkage on the two local shipments was approximately the same, that on one car amounting to 5.29 per cent and the other 5.67 per cent. These two cars, one a mixed load and the other consisting entirely of lambs, averaged 9,785 pounds in weight at the market, and as the marketing costs shown in the table on shipments from Illinois applies entirely to them no detailed explanation of the items is deemed necessary.

The data on sheep from Michigan apply to one double-deck car shipped to Buffalo.

The two shipments originating in Colorado consisted of fat lambs loaded in the best pulp feeding district in the northern part of the state. One shipment of two double-deck cars went to St. Joseph, and the other, consisting of three double-decks, was sold in Kansas City. The latter shipment was the heavier, averaging slightly more than 11,000 pounds per deck at the market. The sales weight of the St. Joseph consignment averaged 10,383 pounds per deck, but there were three less lambs loaded to each deck. The net shrinkage on the lambs consigned to Kansas City was one per cent less than on those to St. Joseph.

The records of the four shipments from Wyoming were obtained

from one of the largest sheep growers in that state. The consignments, all double-deck cars, were marketed in Denver.

It will be noted with particular interest that all of the cars loaded in Wyoming were loaded much heavier than those loaded in the other states, the full minimum weight allowance being attained in every shipment. The cars averaged 126 sheep to the deck, and with the exception of 130 wethers all of the sheep were old ewes.

The net shrinkage resulting on the Wyoming shipments varied widely, ranging from 1.86 per cent to 6.29 per cent, and averaging 3.53 per cent. No information is available as to the reasons for this variation, but, as stated elsewhere, shrinkage fluctuates widely under identically the same conditions for the same classes of stock.

Summarizing the data shown in Table 7, it is very conclusive that sheep and lambs shrink more in proportion to their weight than other classes of stock while en route to market.

HOGS

Classification of Shipments

Records on 873 shipments of hogs comprising 1193 cars, double-decks counted as two cars, were used in this report in making the comparisons on cost of marketing hogs. These records represent two distinct methods of marketing; viz: consignment to commission firms at public stock yards, and consignment direct to packing companies. Stock marketed by either method is consigned either by the farmer, local stock buyer, or live stock shipping association. A commission firm receiving consignments has entire charge of the disposition of the stock, which is sold to packer buyers, city butchers, or shippers. The proceeds of the sale, less commission and other marketing charges, are the net proceeds received by the owner of the stock. Stock consigned direct to a packer is sold either at a previously stipulated price or at the market price on day of arrival. Practically all the records of consignments direct to packing plants were obtained from local dealers, this class of shippers doing more business direct than farmers.

In making comparisons of the two methods of marketing hogs, the data on shipments to centralized markets were tabulated so as to show the differences in shrinkage of shipments made by farmers, local dealers and cooperative shipping associations. Table 6 shows the distribution of the records according to class of shipper, destination, and treatment in regard to fill after arrival, where shipments were consigned direct to packing plants. As has been stated, many of the records used in this investigation were obtained by transcribing records and account sales of local dealers. Inasmuch as this class of shippers market more hogs than do farmers or cooperative shipping

organizations and are more inclined than farmers to keep accounts of their shipments, it was only natural that the majority of the records should be obtained from them. The data collected have been assembled in several tables, so as to show the effect of variations in factors that influence shrinkage and marketing expenses. These factors are: amount of feed placed in car or fed en route, season of the year, time in transit, distance traveled, and size of load, on basis of both weight and number of animals per car.

The difference in the shrinkage resulting from shipping to either point, will determine which is the most profitable method of marketing. Therefore, it is only necessary to determine if one method furnishes an advantage over the other as regards the net shrinkage from the time of loading to the time of weighing, to the buyer. With this factor in mind, the data obtained on shipping hogs direct to packing plants were compiled only to show the average shrinkage resulting from shipping to these plants, with a view to making comparisons with the amount of shrinkage resulting in shipping to the central markets where the animals are given feed and water and allowed to rest before weighing.

Feed in Car or En Route

It is a common practice in shipping hogs either to centralized markets or direct to packing plants to provide them with feed either in the car, or, if necessary to unload to comply with the 28-36 hour law, at feeding-in-transit stations. The advisability of placing feed in the car from an economical standpoint is questionable and depends entirely on the motives of the shipper and what is expected to be gained. In order to determine the relative extent of the practice among farmers and dealers of providing feed en route in shipping hogs to centralized markets, Table 11 was constructed. This table shows

the variation in the extent of feeding according to season and length of time in transit. It will be noted that with the exception of shipments made during the spring and fall, farmers are more inclined than dealers to supply feed to hogs en route. During the spring and fall months the proportion of farmer shipments receiving feed en route exceeded that of dealers by approximately 13 per cent. During the summer months the proportion of farmer shipments receiving feed en route exceeded that of dealers by about 16 per cent. During the winter all farmer shipments in transit more than 14 hours received feed in car or en route while there were dealer shipments in transit as much as 68 hours without receiving feed. The tendency as a rule, both among farmers and dealers, is to practice feeding en route to a greater extent during the winter months than in any other season, altho the proportion of farmer shipments receiving feed was greatest in the summer, the season in which occurred the greatest percentage of dealer shipments without feed. Undoubtedly the greater proportion receiving feed in the winter months is due to feed being more plentiful and to the fact that shippers believe that in cool weather feeding can be practiced without danger of loss from overheating. The fact that the greater proportion of shipments not receiving feed occurs in the spring and fall may serve to emphasize the importance of the supply of feed available. The new corn crop in the cornbelt is hardly available for use until the late fall, and in the spring the available supply is becoming low, thereby encouraging economy in its use. During the summer months, if corn is available on the farm there will be a tendency among the farmers to utilize it in order to make room for the crop that is to be harvested. On the other hand, dealers are not so inclined to feed inasmuch as they have to purchase all feed used, and they have found by experience that

precautions should be taken to avoid loss through overheating. As stated before, it is during this season that the greatest proportion of dealers' shipments receive no feed.

Table 12 is a summary of the data showing the amount of feed per cwt. given to hogs in car and en route by farmers and dealers during the different seasons and according to the length of time in transit. It is apparent from this table that farmers feed more heavily in car and en route than local dealers. This is further corroborated by averaging all the data for each class of shippers according to time in transit but without regard to seasons. Such an average shows that for any given length of time in transit farmers use more feed per cwt. of hogs than dealers. It also shows that as the length of time in transit increases the difference between the amounts fed by the two classes of shippers increases. Stating the proposition somewhat differently, farmers and dealers both increase the amount of feed given to hogs en route as the time in transit increases, but farmers increase the amount in the greater proportion.

Both classes of shippers use the least amount of feed in the spring and fall, farmers feeding the maximum amount in the winter months. There is not much variation in the seasonal quantities used by dealers until after shipments are in transit more than 30 hours. Where shipments are in transit more than this length of time dealers feed more heavily in the summer months.

It is very evident that both farmers and dealers take the length of time in transit into consideration in deciding on the quantity of feed to provide for the hogs while en route to market. For instance, in the shipments on which data were collected for Table 12, it will be seen that increasing the length of time in transit for dealer shipments in the winter months from an average of 11 to an average

TABLE 12 - Summary showing effect of season and time in transit on quantity of feed given to hogs in car and en route by dealers and farmers in shipping to centralized markets.

Season	Shipping Agency	Hours in Transit: Range	Hours in Transit: Avg.	Length of haul in miles	No. Cars or Decks	Avg. lbs. hogs per car	Avg. loading weight per car	Avg. weight of hogs	Average feed per cwt. of animal-Lbs.
Winter	Dealers	4 - 14	11	84	56	74	16,015	213	1.34
		15 - 20	17	160	52	77	16,485	211	1.89
		21 - 30	26	324	62	77	16,477	215	2.08
		31 - 49	39	368	44	75	16,628	215	2.78
		72 -184	100	429	10	83	18,383	200	2.85
	Average	4 -184	26	239	224	76	16,478	216	2.04
	Farmers	11 - 14	12	71	6	76	17,750	234	1.45
		16 - 20	17	177	3	79	16,948	217	2.89
		21 - 30	26	410	14	73	16,353	229	2.63
		32 - 43	36	455	12	73	15,848	222	3.95
	Averages	11 - 43	27	347	35	74	16,470	221	2.85
Spring & Fall	Dealers	7 - 14	12	123	19	76	16,133	213	1.54
		15 - 20	18	194	42	75	15,857	211	1.83
		21 - 30	24	226	22	75	17,328	237	1.85
		33 - 52	37	400	18	72	16,837	231	2.24
	Averages	7 - 52	22	224	101	74	16,513	221	1.84
	Farmers	14 - 19	17	147	14	65	15,272	243	1.63
		21 - 24	22	189	5	58	16,242	280	2.12
		35 - 46	37	553	10	68	16,917	201	2.41
	Averages	14 - 46	25	294	29	65	16,007	245	1.99
Summer	Dealers	4 - 14	10	164	23	62	15,213	242	1.77
		15 - 20	18	226	48	75	16,303	218	1.78
		21 - 29	23	339	43	66	16,487	251	1.84
		31 - 36	33	437	18	61	16,677	271	3.02
		55 - 83	73	728	11	80	17,093	212	3.44
	Average	4 - 83	31	315	143	68	16,291	236	2.04
	Farmers	4 - 14	10	134	20	69	16,063	232	1.57
		15 - 20	18	233	23	66	16,190	245	2.14
		21 - 27	23	268	10	69	16,934	249	2.20
		32 - 36	35	407	7	66	16,393	257	2.79
		78	78	686	3	91	20,580	225	4.74
	Averages	4 - 78	32	226	63	68	16,493	240	2.18

of 17 hours, increased the quantity of feed per cwt. of live animal 0.55 lbs., or 41 per cent. Increasing the time from 11 to 39 hours increased the feed used 1.44 lbs. per cwt. or 107.5 per cent. However, when the time in transit was increased to an average of 100 hours the amount of feed used was only slightly greater than that for 39 hours. There was an increase of 0.34 lbs. per cwt. or 22 per cent in the quantity of feed used by dealers from an average of 12 to an average of 17 hours. When the time exceeded 30 hours the increase in feed amounted to 0.7 lbs. per cwt. or 45 per cent, whereas in the case of farmer shipments the increase was approximately 0.8 lbs. per cwt. or 48 per cent. Dealer shipments made during the summer received approximately the same amount of feed per cwt. for an average of 10, 18, and 23 hours; when the time was increased to an average of 33 hours, the average quantity of feed given was increased by 1.45 lbs., per cwt., or 71 per cent.

Dealer shipments in transit an average of 73 hours received 94 per cent more feed than those in transit an average of 10 hours, Farmer shipments in transit an average of 12 hours during the winter months received 1.45 pounds of feed per cwt. of live animal while en route to market. When this time was increased to an average of 17 hours, the amount of feed was increased 100 per cent, and when it was increased to an average of 36 hours the feed was increased 172 per cent. During the summer season farmer shipments in transit an average of 10 hours received an average of 1.57 pounds of feed per cwt. of live animal and in addition of 8 hours to this time increased the feed supply en route by 36 per cent. Those shipments in transit an average of 35 hours received approximately 78 per cent more feed than those in transit an average of 10 hours, and when the time was increased to an average of 78 hours the amount of feed was increased 202 per cent

Feed at Destination

The data relative to the amount of feed fed to hogs after arrival at the centralized markets indicate that there is little uniformity as to the amount of feed given, and it is very evident that shippers differ in their ideas as to the amount of feed needed to put the stock in the best condition for sale. The extreme range in the amount of feed fed to hogs, according to the records collected, was from 0.57 to 6 pounds per cwt. of live animal. A summary of 152 consignments containing 13,898 animals showed that an average of 1.95 pounds of corn per cwt. of hogs was used at destination.

Shrinkage of Hogs in Transit to Central Markets.

The data obtained on shipments of hogs were sufficiently complete to make different comparisons to ascertain the effect of various factors on shrinkage in transit. The factors which were given consideration in this report are length of time shipments were in transit, size of load both from standpoint of number of animals loaded, size of hogs, seasonal conditions, shipping agency, i.e., farmer, dealer, or cooperative live stock shipping association, and treatment as regard to feeding en route and feeding and watering at destination. Altho these various factors bear a close relationship and should be considered together as much as possible, in order to determine what influence they have on shrinkage, it is necessary to study them separately because of the complexity of the problem when an attempt is made to consider them as a whole.

Relation of length of time in transit to shrinkage of hogs.

Tables 13 and 14 were compiled to show the effect of time in transit on shrinkage. In constructing these tables the data were

TABLE 13 - Summary showing effect of season and time in transit on shrinkage of hogs having access to feed in car or en route when shipped by dealers and farmers to centralized markets.

Season	Shipping Agency	Hours in transit Average	No. of cars or decks	Car Loading wt. Avg.	Car sales Weight Average	Shrinkage or fill per cwt. lbs. Average	Range
Winter	Dealers	11	56	16,015	15,772	-1.52	+1.55 - 4.70
		17	52	16,485	16,225	-1.57	+2.73 - 5.10
		26	62	16,477	16,295	-1.11	+1.82 - 4.71
		39	44	16,628	16,246	-2.30	+1.47 - 6.90
		100	10	18,383	17,499	-4.81	-2.79 - 7.50
	Average	26	234	16,473	16,192	-1.74	+2.73 - 7.50
	Farmers	11	6	17,750	17,665	-0.48	+1.41 - 1.07
		17	3	16,948	16,816	-0.77	+0.09 - 1.25
		26	14	16,353	16,250	-0.63	+3.33 - 2.26
		36	12	15,848	15,697	-0.94	+2.49 - 2.65
	Average	27	35	16,470	16,352	0.72	+3.33 - 2.65
Spring & Fall	Dealers	12	19	16,133	15,491	-2.18	+0.38 - 4.41
		18	42	15,857	15,608	-1.57	+1.14 - 4.71
		24	22	17,828	17,559	-1.51	+2.37 - 3.98
		37	18	16,837	16,386	-2.68	-0.94 - 5.00
	Average	22	101	16,513	16,204	-1.87	+2.37 - 5.00
	Farmers	17	14	15,272	15,252	-0.14	+2.89 - 3.15
		22	5	16,242	16,360	+0.73	+3.64 - 1.39
		37	10	16,917	16,733	-1.09	+0.14 - 2.42
	Average	25	29	16,007	15,953	0.33	+3.64 - 3.15
Summer	Dealers	10	23	15,213	14,938	-1.81	-0.18 - 2.75
		18	48	16,303	16,035	-1.64	+2.59 - 4.90
		23	43	16,487	16,157	-2.01	+1.48 - 9.88
		33	18	17,677	16,157	-3.12	+1.59 - 9.06
		73	11	16,093	16,559	-3.12	+1.56 - 5.84
	Average	31	143	16,291	15,951	-2.09	+2.59 - 9.88
	Farmers	10	20	16,063	16,052	-0.07	+1.88 - 2.07
		18	23	16,190	16,253	+0.39	+4.59 - 3.43
		23	10	16,934	16,831	-0.61	+4.53 - 3.66
		35	7	16,393	16,083	-1.90	+1.23 - 4.92
		78	3	20,580	19,680	-4.37	- 4.37
	Average	32	63	16,499	16,425	-0.45	+4.59 - 4.92

TABLE 14 - Summary shwoing effect of season and time in transit on shrinkage of hogs not having access to feed in car or en route when shipped by dealers and farmers to centralized markets.

Season	Shipping Agency	Hours in transit Average	No. of cars or decks	Car loading wt. Average	Car sales weight Average	Shrinkage or fill per cwt. lbs. Average	Shrinkage or fill per cwt. lbs. Range
Winter	Dealers	11	25	16,492	16,251	-1.45	+1.04 - 4.55
		17	17	16,069	15,746	-2.01	+0.17 - 4.58
		26	6	16,263	15,890	-2.30	-1.35 - 4.27
		49	6	16,683	15,135	-3.50	-1.96 - 5.00
	Average	19	54	16,243	15,928	-1.94	+1.04 - 5.00
	Farmers	12	7	15,488	15,484	+0.02	+1.24 - 1.88
Spring & Fall	Dealers	11	11	17,025	16,738	-1.68	0.00 - 5.28
		17	16	16,737	16,518	-1.31	+0.91 - 3.33
		26	10	15,909	15,497	-2.59	+0.13 - 6.42
	Average	18	37	16,599	16,307	-1.76	+0.91 - 6.42
	Farmers	11	10	17,325	17,290	-0.20	+4.22 - 1.38
		17	7	16,206	16,254	+0.30	+4.18 - 3.09
		32	2	17,562	17,655	+0.53	+1.52 - 0.49
	Average	16	19	16,933	16,946	+0.05	+4.22 - 3.09
Summer	Dealers	10	23	14,068	13,770	-2.12	-0.06 - 6.81
		17	35	15,657	15,290	-2.34	+2.56 - 5.77
		24	7	16,303	16,386	-2.49	-0.60 - 3.94
	Average	15	65	15,218	14,870	-2.29	+2.56 - 6.81
	Farmers	7	6	14,878	14,748	-0.87	+0.73 - 2.28
		21	5	17,974	17,838	-0.76	+0.68 - 5.56
	Average	10	11	16,285	16,152	-0.82	+0.73 - 5.56

Table 14A - Summary showing by data collected the average miles per hour of the movement of live stock to the Cleveland market during the month of April 1917.

Received via Railroads	No. cars	Hours Enroute	Miles Traveled	Average Miles Per Hour
C.C.C. & ST. L. RY.	61	2724	10506	3.9
N.Y.C. R.R.	42	1855	7605	4.1
N.Y.C. & ST. L. R.R.	68	2652	13176	4.9
Penn. Co.	32	868	3301	3.8
W. & L.E. R. R.	26	985	4714	4.8
B. & O. R. R.	16	611	1755	2.9
Erie R. R.	10	239	847	3.5

grouped according to whether or not the animals had access to feed en route, whether the shipper was a framer or a local dealer, the season of the year, and the length of time in transit. The hogs in the shipments on which data were used in making Table 13 had access to feed either in car or en route, while those on which data were obtained for Table 14 received no feed from time of loading until after arrival at market. The quantity of feed given the hogs on which the data were obtained in Table 13 is shown in Table 12. The shipments were grouped according to time in transit as follows: fourteen hours and under, 15 to 20 hours, 21 to 30 hours, 31 to 50 hours, and 51 hours and over. No distinction was made as to weight of cars or number of animals loaded per car. A study of Table 13 reveals that shipments made by farmers sustain a less net shrinkage than those made by dealers. In fact, some of the groups of farmer shipments show a fill instead of a shrink, while in every group of dealer shipments there was a loss in weight instead of a gain. The shrinkage on the dealer shipments was greatest during the summer months and least in the winter, the loss in weight on shipments made during the spring and fall coinciding approximately with the average shrinkage for all seasons. Farmer shipments with access to feed en route sustained the least shrink during the spring and fall months, the maximum shrinkage being recorded in the summer on those shipments in transit more than 20 hours. Farmer shipments made during the winter months showed little fluctuation in the average shrinkage, the percentage being approximately the same for any given length of time in transit. In both farmer and dealer shipments there is little fluctuation in the shrink until after the shipments have been in transit more than 20 to 30 hours, after which period the loss in weight increases more abruptly. The number of farmer

shipments shown in Table 14 without access ot feed en route were not sufficient to make a fair comparison with this class of shipments. In this group all shipments made during the spring and fall showed a slight gain instead of a loss in weight. Shipments made by dealers without access ot feed showed a steady loss in weight as the time in transit increased.

Summarizing the facts brought out in Tables 13 and 14, the most striking features shown are: that the use of feed en route does not appear to influence materially the shrinkage of hogs in transit, especially on all shipments en route less than 30 hours; that farmers ship hogs with less shrink than dealers, that after the first 20 to 30 hours en route the shrinkage increases in direct ratio with the increase in time in transit. that during the first 20 to 30 hours the average shrinkage fluctuates very little, ranging between one and two per cent for dealer shipments and from a slight gain to less than one p per cent with farmers' shipments, and that the average shrinkage for b both farmer and dealer shipments does not exceed three per cent until shipments have been in transit approximately 50 hours or more.

Relation of Size of Load based on number of Hogs per car in Shrinkage. Tables 15 and 16 were constructed to show the relation, if any, of size of load, based on the number of animals per car, to shrinkage, in shipping hogs to centralized markets. Table 15 contains data on hogs having access to feed, either in car or en route, while Table 16 contains data on those shipments receiving no feed in car or en route. The shipments were grouped according to the number of animals per car as follows (all cars considered as single decks): 60 hogs and less, 61 to 70, 71 to 80, 81 to 90, and 91 and over. It will be noted that in practically every instance there was a decrease in the average weight of the hogs, as the number loaded per car increased.

TABLE 16 - Summary showing relation of size of load based on number of animals per car to shrinkage in shipping hogs without access to feed in car or en route to centralized markets.

Season	Shipping Agency	No. of hogs per car: Average	Range	No of cars	Hours in Transit: average	Car loading: wt.avg.	Car sales: wt.avg	Av. Wt. of: Hogs	Shrinkage of fill per cwt.: Average.
Winter	Dealers	57.5	56 - 59	6	22.5	13,780	13,447	240-	-2.42
		63.0+	61 - 68	15	19.0+	14,523	14,257	229	-1.83
		75.5	71 - 80	13	17.0-	16,333	16,164	216+	-1.03
		85.0+	81 - 90	14	18.0+	17,803	17,369	209	-2.44
		102.	93 -130	7	18.0-	19,534	18,892	192	-3.28
	Farmers	57	55 - 60	3	14-	14,407	14,410	253-	+0.02
		74	72 - 76	3	12	15,825	15,740	213-	-0.58
		90		1	13	17,720	17,940	197	+1.24
Spring & Fall	Dealers	57.5	57 - 58	4	28	12,580	12,130	218	-3.58
		68-	66 - 70	4	14+	18,985	18,545	280	-2.31
		76-	72 - 79	22	18	16,724	16,513	221	-1.26
		81+	81 - 82	4	14+	17,516	17,077	215	-2.50
		102-	94 -109	3	14+	16,635	16,360	163	-1.65
	Farmers	59-	58 - 59	2	13-	15,930	15,765	270+	-1.04
		66+	61 - 70	8	17-	16,500	16,700	249-	+1.21
		77+	71 - 80	7	14+	17,449	17,353	224+	-0.55
		83	82 - 84	2	23-	17,908	17,695	216-	-1.19
Summer	Dealers	53-	42 - 59	16	12+	13,452	13,209	255-	-1.80
		66-	61 - 70	21	16-	15,850	15,360	241+	-3.05
		74	70 - 80	8	15-	16,126	15,633	218-	-3.06
		88-	82 - 90	14	17	15,081	14,843	172-	-1.57
		95	91 -102	6	15+	16,828	16,605	177-	-1.33
	Farmers	52+	45 - 57	3	10	14,103	14,007	269	-0.69
		63		1	4	14,530	14,440	231	-0.62
		76	74 - 78	6	17-	17,115	17,117	225+	+0.01
		93		1	15	19,610	18,520	211	-5.56

TABLE 15 - Summary showing relation of size of load based on number of animals per car to shrinkage in shipping hogs with access to feed in car or en route to centralized markets.

Season	Shipping Agency	No. of hogs per car: Average	Range	No. of cars	Hours in transit: Average	Car loading wt. Average	Car sales weight Average	Average weight of hogs	Feed enroute av. per cwt.	Shrinkage or fill per cwt. av
		54	44 - 60	19	19-	14,363	14,266	265	1.96	0.67
		65	61 - 70	40	23-	15,815	15,520	240	2.13	1.87
	Dealers	75	71 - 80	94	28+	16,633	16,347	220	1.91	1.72
		85	81 - 90	50	22+	16,673	16,357	195+	2.01	1.89
		99	91 -112	21	38-	18,496	18,127	186	2.54	1.99
Winter										
		57	56 - 60	4	28+	15,177	14,915	264	1.88	-1.72
	Farmers	63	61 - 67	7	32	16,161	16,031	255	4.09	-0.80
		75	71 - 79	13	25+	17,085	16,989	227	2.55	-0.56
		83	81 - 87	8	25+	16,250	16,103	195	2.52	-0.90
		96	93 -103	3	26	16,838	16,920	174	3.64	+0.48
		56	51 - 60	10	26	16,579	16,109	296	2.09	2.83
	Dealers	66	61 - 70	33	19-	15,584	15,338	235	1.78	1.57
		75	71 - 80	29	22+	16,332	16,073	215	2.08	1.58
		86	82 - 90	20	18+	17,375	17,038	201	1.96	1.94
Spring		97	91 -110	9	26	18,576	18,055	190	1.17	2.80
&										
Fall		54	51 - 60	6	24	15,755	15,727	289	1.84	-0.18
	Farmers	64	61 - 70	16	24-	15,694	15,690	245	1.60	-0.03
		72	71 - 73	4	21+	17,142	16,850	238	2.41	-1.70
		83	81 - 87	3	35	16,663	16,620	200	3.71	-0.26
		55	46 - 60	27	23	13,953	13,816	250+	2.87	3.13
	Dealers	65	61 - 70	57	22+	16,414	16,102	252+	1.95	1.90
		76	71 - 80	37	25+	17,078	16,757	224	2.03	1.88
		85	81 - 90	16	35-	17,221	16,859	202	1.56	2.10
		92	91 - 94	5	30+	18,080	17,832	196	2.20	1.37
Summer										
		48	32 - 59	11	19	12,839	12,916	263	2.53	+0.60
	Farmers	64	61 - 70	25	16	16,058	16,076	250	2.29	+0.11
		75	71 - 80	18	19+	17,641	17,465	234	1.61	+0.09
		86	82 - 90	4	19+	18,991	19,007	220	2.14	-0.94
		96	91 -107	5	52	20,655	20,048	213	3.18	-2.93

For this reason the average car loading weights did not vary as widely as the fluctuation in the number of animals per car would indicate. Where cars were loaded with less than 60 hogs, the average weight of the animals was much greater than where 90 or more hogs were loaded. A study of the figures in Tables 15 and 16, showing shrinkage or fill for the different groups, does not reveal facts which will allow drawing very definite conclusions. While there is considerable variation in the different groups in the amount of shrinkage, there is no positive evidence to indicate that the size of load based on number of hogs per car exerts any material influence on the amount. There is some indication that the minimum shrinkage takes place in those shipments where the average number of animals per car approaches 75, and that as the number loaded decreases from or increases to 75, the loss due to shrinkage tends to increase. In five of the six seasonal groupings of dealer shipments this tendency holds true and this would appear to justify the assumption that the maximum number of animals to load to a car to reduce shrinkage to the minimum would be approximately 75. However, much would depend on the weight of the animals, inasmuch as extremely heavy hogs or very light hogs very often show extreme fluctuations in shrinkage, and definite conclusions as to the effect of the size of load based on number of animals loaded, are not justified. The data in Tables 15 and 16 apply to the same shipments which were used in compiling Tables 13 and 14, therefore, it is apparent that these tables would show the same differences between the amount of shrinkage sustained by farmer shipments and the amount sustained by dealers shipments; that is, farmer shipments shrink less than those made by dealers.

Relation of Weight of Load to Shrinkage of Hogs in Transit to Centralized Markets.

Tables 17, 18, 19 and 20 were constructed to show if the weight of load had any effect on shrinkage of hogs in tranist to market. Tables 17 and 18 contain data on dealer and farmer shipments having access to feed in car or en route, while Table 19 contains data on shipments receiving no feed until after arrival at market. Table 20 is a summary of the data on shipments consigned by cooperative shipping associations. With the exception of the data on winter shipments, this table did not include a sufficient number of consignments to warrant conclusions.

Although there is considerable fluctuation in the averages for the different groups, the figures in Tables 17 and 18, showing average shrinkage or fill indicate that as the weight of the load increases there is a general tendency for the hogs to lose weight proportionately. The least fluctuation in the average amount of shrinkage through out the year took place in dealer shipments weighing between 15,000 and 19,000 pounds. The lighter loads of dealer shipments showed the least shrinkage during the winter months, while those loads weighing more than 18,000 pounds showed the greatest shrinkage during the cold weather.

Dealer shipments receiving feed in car or en route showed a more uniform rate of shrinkage than those not receiving feed. Dealer shipments also showed less fluctuation in shrinkage than shipments made by farmers. The shrinkage on dealer shipments with feed en route ranged between one and three per cent of loads of all weights. The figures showing averages shrinkage on farmer shipments receiving feed en route ranged from a gain in weight of more than two per cent to a

TABLE 18 - Summary showing effect of weight of load on shrinkage of hogs to centralized markets. Farmer shipments with access to feed in car or en route.

Season	No. of Cars	Avg. No. hogs per car	Avg. time in transit	Avg. feed in transit per cwt. of hogs	Avg. Car loading weight	Avg. Car sales weight	Avg. sales weight of hogs	Shrinkage per cwt.
			Hours	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
	2	57	29	1.32	12,885	12,680	222	-1.58
	5	75	35	4.28	14,397	14,422	192	+0.17
Winter	6	80-	26	2.28	15,640	15,563	197	-0.49
	10	71	29	3.34	16,704	16,610	235	-0.56
	5	56	26	3.05	17,509	17,270	204	-1.37
	7	71	20	2.10	18,615	18,433	261	-0.97
Average	35	74	26	2.87	16,470	16,352	221	-0.72
	6	63	20	1.20	13,073	13,212	208	+1.06
Spring	6	64	22	2.92	14,612	14,702	228	+0.62
&	3	66	25	2.21	15,903	16,075	240	+1.07
Fall	9	68	25	2.19	17,551	17,368	260	-1.04
	5	64	34	1.36	18,485	18,130	289	-1.92
Average	29	65	25	2.00	16,007	15,954	246	-0.33
	9	51	13-	2.52	11,521	11,787	225	+2.30
	4	59	13	1.98	14,560	14,565	248	+0.03
	13	66	21	2.36	15,555	15,508	235	-0.30
Summer	9	63-	19	2.91	16,628	16,761	266	+0.80
	10	73	18	1.91	17,395	17,399	240	-0.32
	9	76	19-	1.34	18,268	17,956	243	-1.71
	9	88	38	2.43	20,814	20,336	237	-2.30
Average	63	69	21	2.19	16,500	16,426	240	-0.45

TABLE 17 - Summary showing effect of weight of load on shrinkage of hogs to centralized markets. Dealer shipments with access to feed in car or en route.

Season	No. of cars	Avg. No. hogs per car	Avg. time in transit Hours	Avg. feed in transit per cwt. of hogs Lbs.	Avg. car loading weight Lbs.	Avg. car sales weight Lbs.	Avg. sales weight of hogs Lbs.	Shrinkage per cwt. Lbs.
	15	65	15	1.94	12,864	12,723	197	-1.09
	27	70	18	1.87	14,490	14,288	207	-1.16
	23	79	25	2.85	15,435	15,242	196	-1.25
Winter	24	79	31	2.37	16,566	16,253	209	-1.89
	46	76	26	1.66	17,375	17,095	230	-1.61
	67	79	33	2.13	18,461	17,938	235	-2.83
	22	93	36	1.86	20,520	20,046	221	-2.31
Average	224	76	26	2.04	16,478	16,192	216	-1.74
	15	68	17	1.99	12,567	12,394	185	-1.37
	8	73	15	2.15	14,695	14,319	202	-2.56
	11	77	21	1.89	15,425	15,115	200	-2.01
Spring	23	77	24	2.14	16,506	16,287	213	-1.33
&	24	73	23	1.78	17,479	17,182	239	-1.70
Fall	7	68	22	1.62	18,266	17,777	267	-2.67
	7	76	18	1.86	19,401	18,943	255	-2.36
	6	92	25	1.20	21,552	20,992	233	-3.41
Average	101	75	21	1.87	16,513	16,205	221	-1.87
	18	59	15	2.71	11,819	11,580	201	-2.03
	9	69	19	1.75	14,677	14,211	213	-3.18
	24	65	28	2.63	15,483	15,243	238	-1.55
	39	69	22	2.03	16,551	16,215	239	-2.03
Summer	33	73	35	2.06	17,512	17,134	240	-2.16
	11	78	28	1.82	18,160	17,720	248	-2.42
	11	79	15	1.32	19,641	19,255	249	-1.96
Average	142	69	25	2.09	16,339	16,000	236	-2.08

TABLE 19 - Summary showing effect of weight of load on shrinkage of hogs to centralized markets. Dealer and Farmer shipments without access to feed in car or en route.

Season	Shipping Agency	No. of cars	Avg. No. hogs per car	Avg. time in transit Hours	Avg. car loading weight Lbs.	Avg. car sales weight Lbs.	Avg. sales weight of hogs Lbs.	Avg. shrinkage or fill per cwt. Lbs.
		16	62	20	13,183	12,863	211	-2.42
		5	89	29	14,622	14,111	165	-3.50
	Dealers	4	69	25	15,454	15,270	225	-1.19
		10	77	14	16,733	16,546	219	-1.12
Winter		8	78	17	17,534	17,329	224	-1.17
		7	83	15	18,896	18,516	228	-2.01
		5	98	17	22,620	21,791	330	-3.67
Average		55	76	19	16,342	16,002	210	-2.08
		3	62	16	12,775	12,687	205	-0.69
		1	75	7	16,300	16,380	217	+0.49
	Farmers	2	81	12	17,685	17,755	218	+0.40
		1	60	13	18,420	18,440	307	+0.11
	Average	7	69	13-	15,488	15,484	884	-0.02
		7	68	22	11,919	11,636	175	-2.38
		2	76	28	14,615	14,635	192	+0.13
	Dealers	1	94	13	15,890	15,420	169	-2.95
Spring		7	80	16	16,509	16,273	206	-1.42
&		6	80	15	17,655	17,407	220	-1.46
Fall		13	64	17	18,708	18,396	252	-1.67
		1	66	15	20,860	20,740	316	-0.57
	Average	37	76	18	16,599	16,335	816	-1.59
		3	64	15	13,208	13,740	206	+4.03
		2	75	18	15,333	15,600	204	+1.74
	Farmers	1	79	16	16,400	16,370	208	-0.18
		6	74	19	17,378	17,347	236	-0.18
		5	72	14	18,475	18,210	255	-1.43
		2	65	12	19,245	19,038	296	-1.09
	Average	19	71	16	16,938	16,947	838	+0.05

TABLE 19-continued. Summary showing effect of weight of load on shrinkage of hogs to centralized markets. Dealer and Farmer shipments without access to feed in car or en route.

Season	Shipping Agency	No. of cars	Avg. no hogs per car	Avg. time in transit Hours	Avg. car loading weight Lbs.	Avg. car sales weight Lbs.	Avg. sales weight of hogs Lbs.	Avg. shrinkage or fill per cwt. Lbs.
		13	54	12	11,647	11,432	217	-1.85
	Dealers	19	80	14	14,330	14,168	179	-1.13
		6	68	14	15,493	15,030	228	-2.99
		11	76	19	16,765	16,252	222	-3.06
		11	72	16	17,662	17,131	246	-3.01
		5	74	15	18,775	18,274	255	-2.66
	Average	65	71	15	15,218	14,870	209	-2.29
Summer								
		2	50	10	12,975	12,770	260	-1.79
	Farmers	2	70	15	14,495	14,465	209	-0.21
		1	78	4	15,730	15,660	202	-0.45
		2	66	10	16,530	16,425	252	-0.64
		4	88	20	18,853	18,675	235	-0.95
	Average	11	70	14	16,285	16,153	231	-0.82

TABLE 20 - Summary showing effect of weight of load on shrinkage of cooperative shipments of hogs to centralized markets.

Season	No. of cars	Avg. No. hogs per car	Avg. Car loading weight Lbs.	Avg. Car sales weight Lbs.	Avg. sales weight of hogs Lbs.	Shrinkage per cwt. Lbs.
	3	73	11,783	11,483	161	-2.55
	3	73	14,556	14,440	199	-0.81
Winter	15	78	15,503	15,329	198	-1.12
	29	75	16,435	16,192	221	-1.78
	22	77	17,440	17,129	228	-1.84
	9	79	18,322	17,967	233	-1.94
	5	79	19,738	19,365	249	-1.89
Average	91	76	16,590	16,314	214	-1.66
	1	54	14,645	14,480	271	1.12
Spring	1	79	15,130	15,130	192	0.07
&	4	77	16,330	16,118	213	-1.30
Fall	1	63	17,210	17,130	273	-0.46
	2	84	18,600	18,650	231	+0.27
Average	9	74 +	16,612	16,500	222	-0.68
	3	45	11,810	11,700	262	-0.93
Summer	2	62	14,585	13,970	235	-4.21
	4	60	16,290	16,073	273	-1.34
	2	62	17,335	16,990	282	-1.99
Average	10	58-	15,262	14,961	258	-1.98

loss of like amount, a total range of more than four per cent. Dealer shipments without access to feed showed a range in average shrinkage of almost four per cent, those loads averaging slightly more at the market than at loading stations. The data on farmer shipments without access to feed en route were not sufficiently complete to show any uniform tendency as to effect of weight of load on shrinkage. An average of all the data on dealer and farmer shipments without regard to season shows that feed in car or en route appears to exert little or no influence on shrinkage or fill. Hogs shipped without access to f feed in car or en route showed greater fluctuation in shrinkage than those with access to feed, the latter showing a more uniform tendency to lose weight in proportion to the increase in the weight of load. Farmer shipments below 17,000 pounds in weight showed a shrinkage which increased sharply as the weight of load increased beyond 18,000 pounds. Dealer shipments showed uniform tendency to shrink from 1½ to 2½ per cent for loads of all weights. An average of all the data by seasons, but without regard to shipping agency or feed in transit, shows that the least shrinkage with hogs took place during the spring and fall months, and the greatest on extremely light and extremely heavy loads in the winter months. Loads weighing between 14,000 and 18,000 pounds did not exceed two per cent, and loads weighing more than 20,000 pounds did not exceed an average of more than 2.6 per cent.

The data covering cooperative shipments wer copied from the records of the managers of the associations and it was not possible, to obtain information relative to the amount of feed the hogs received en route. With the exception of the group of extremely light loads, the data on the winter shipments indicate that as the load increases there is a tendency for the net shrinkage ot increase. The average shrinkage on cooperative shipments was slightly less than that on

dealer shipments but more than the average of farmer shipments.

Effect of Size of Hogs on Shrinkage in Transit to Market

In order to determine if there be any relation in size of hogs in the amount of shrinkage resulting in shipping these animals to market, the shipments were segregated into three groups, according to the average weight of the hogs in each load. These groups, with their respective data on shrinkage, are shown in Table 21. It will be noted that the minimum shrinkage was recorded on those loads containing the lighter weight animals, the average for this group being 1.09 per cent, the heavy-weight hogs, averaging 277 pounds, sustaining a shrinkage of 1.77 per cent. With the exception of the weight of hogs, the conditions as regards hours en route, distance traveled, and feed supplied, were approximately the same.

The conclusion drawn from the data shown in table 21 is that the increase of net shrinkage is directly proportional to the weight of the animals.

Summarizing all the data on shrinkage of hogs in transit to central markets, the most striking features brought out are that farmers ship hogs to centralized markets with a less shrinkage than that sustained by local dealers: that the shrinkage on local dealer shipments is more uniform for loads of all weights and for the different seasons: that feed does not affect the amount of shrinkage materially. That as the weight of load increases there is a tendency for the amount of shrinkage to increase, and this continues until the loads exceed 20,000 pounds in weight, whereupon the amount does not appear to be affected by weight of load: that as the weight of the hogs increases the net shrinkage increases proportionately.

Shrinkage of Hogs Shipped Direct to Packing Plants.

Data were collected on shipments of hogs consigned direct

TABLE 21 - Showing average shrinkage resulting in shipping hogs to centralized markets according to size of animals.

No. cars	Weight of Hogs		Avg. time in transit	Length of haul	Total Avg. feed per car of hogs at yards and in car	Net Shrinkage per cwt.
	Range	Average				
	Pounds	Pounds	Hours	Miles	Pounds	Pounds
123	135-195	181	24	252	5.05	1.09
583	195-255	226	20	225	4.63	1.29
230	255-400	277	21	230	4.50	1.77

to packing plants for the purpose of comparing the shrinkage resulting in such shipments with that resulting from shipping to centralized markets where stock are allowed to rest and are given access to feed and water before weighing. When a shipper makes a contract with a packing company to consign a load of hogs direct an agreement is made as to whether they will be weighed as they are unloaded from the cars or whether they will first have access to all the water they can drink. In this report shipments sold under the first plan have been designated as "no fill at destination" shipments, while the others have been termed "water fill at destination" shipments and the grouping has been made accordingly.

For purposes of comparison the data have been compiled on the basis of weight of load and on number of hogs per car. Table 22 is the compilation on basis of weight of load, while Table 23 shows the data compiled with regard to the number of animals per car. In studying these tables it must be remembered that practically all consignments direct ot packing plants are hauled relatively short distances by rai, therefore they are no subjected to the various factors causing increased shrinkage bfought about by a long haul. For this reason it is not surprising to find that the shrinkage on this class of shipments is relatively low as compared with the shrinkage on shipments sent to the centralized markets. It will be noted also that the average amount of shrinkage is rather uniform for the different groups. There is little to indicate that the size of load from the standpoint of weight influences the amount of shrinkage; also the tabulation based on number of hogs per car shows little relationship between the number of animals loaded and the amount of shrinkage. The heavy loads in the "no fill" group shrunk the least while in the "water fill" group they showed the maximum shrinkage.

TABLE 23 - Summary showing effect of weight of load and treatment as regard to fill on shrinkage in shipping hogs direct to packing plants.

Treatment at destination	No Cars	Average No. hogs to car	Av. length of haul Miles	Average car loading Wt. Lbs.	Average Car sales Wt. Lbs.	Average weight of hogs Lbs.	Shrinkage per cwt. Lbs.
	5	45	101	13,077	12,944	289	-1.02
	9	65	64	14,292	14,074	218	-1.52
No	10	75	54	15,389	15,153	203	-1.53
fill	15	71	59	16,400	16,105	228	-1.80
	21	78	68	17,414	17,276	222	-0.79
	13	81	35	18,573	13,554	230	-0.13
Average	74	71	60	16,516	16,341	225	-1.06
	16	56	187	12,325	12,123	220	-1.64
Water	8	65	193	14,598	14,311	224	-1.97
fill	20	69	162	15,534	15,259	222	-1.78
	42	74	190	16,480	16,241	223	-1.45
	50	72	175	17,469	17,228	243	-1.38
	23	74	125	18,326	18,009	248	-1.73
	6	75	159	19,496	19,102	259	-2.02
	6	83	162	20,584	20,117	247	-2.27
Average	171	73	177	16,680	16,413	231	-1.60

TABLE 22 - Summary showing relation of size of load, based on number of animals per car, and kind of fill to shrinkage in shipping hogs direct to packing plants.

Season	Kind of Fill	No. of hogs per car: Avg.	Range	No. of cars	Av. length of haul: miles	Car loading weight: Av. lbs.	Car sales weight: Av. lbs.	Avg. wt. of hogs: Lbs.	Shrinkage or fill per cwt.: Av.Lbs.
Winter	Water fill only:	53	30 - 58	10	176	14,487	14,321	273	-1.15
		68	65 - 70	19	195	16,607	16,343	243	-1.60
		74	71 - 80	36	171	17,246	17,039	232	-1.20
		85	81 - 91	7	181	17,264	16,843	203	-2.44
	No fill	56	50 - 60	13	76	14,303	14,145	256	-1.11
		66	64 - 69	5	19	15,873	15,924	239	0.32
		77	71 - 80	19	48	17,048	16,924	222	-0.73
		83	81 - 87	13	37	16,914	16,788	204	-0.74
		100	100	2	14	18,540	18,385	185	-0.84
Spring & Fall	Water fill only:	56	50 - 59	8	160	15,689	15,433	281	-1.64
		67	61 - 70	30	164	16,421	16,134	246	-1.75
		75	71 - 80	41	173	17,237	17,977	230	-1.51
		85	81 - 89	9	201	18,225	17,878	215	-1.91
		103	95 -111	2	161	18,685	18,175	181	-2.73
	No fill	66	59 - 70	3	103	16,380	16,400	257	-2.84
		75	72 - 77	2	75	17,350	17,050	233	-1.73
		82	81 - 83	6	111	17,940	17,660	219	-1.56
Summer	Water fill only:	31	27 - 34	2	174	8,180	7,855	268	-3.97
		67	60 - 73	5	282	15,847	15,558	235	-1.82
		91	88 - 93	2	214	14,158	13,705	156	-3.20
	No fill	68	66 - 70	6	71	16,967	16,650	251	-1.87
		76	72 - 80	5	66	16,243	16,006	215	-1.46

The features in the two tables which would cause the greatest interest are the uniformity in the average weights of the hogs and the difference between the percentage of shrinkage of the two classes of shipments. The uniform average weights indicate that only the best grade hogs are consigned direct to packing plants. It is very probable that packers contracting for hogs delivered at their plants specify very carefully as to the grade of animals that will be accepted.

There is no way to account for hogs receiving no feed or water at destination shrinking less than those having access to water. It is true the difference in the amount of shrinkage is not great, but the data shows that such a condition exists.

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