



# Managing Shrink and Weighing Conditions in Beef Cattle

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In the livestock business producers spend most of their time managing cattle to make them weigh as much as possible by market time. However, when cattle are gathered, transported, processed, or held without access to feed or water, they lose weight. This weight loss is referred to as *shrink* in the cattle business. Experienced cattle buyers and sellers are well aware of shrink and they make certain that cattle are priced accordingly. Various factors and weighing conditions influence the amount of shrink. Knowledge of these factors is important in managing cattle to minimize shrink and to price cattle fairly.

## Sources of Shrink

Fill and tissue shrink are the two kinds of shrink that occur during the transport and marketing of cattle. Cattle held off of feed and water over-night experience *fill shrink*, which is the loss of rumen fill, manure, and urine. This type of shrink is recovered in a short period of time after feed and water intake returns to normal. Table 1 shows shrink of wheat pasture cattle during a 24-hour period after being removed from wheat pasture. These cattle were held in a drylot pen without access to feed or water. Total shrink was over 8 %, but initial weight was regained within six hours after the cattle were returned to pasture. Most of the weight loss experienced by feeder cattle up to pay weight is fill shrink.

*Tissue shrink* is a decrease in the weight of the carcass and other body tissues. This type of shrink is primarily the

**Table 1. Shrink of wheat pasture cattle<sup>a</sup>**

| Hours off wheat   | WT  | % Shrink |
|-------------------|-----|----------|
| 0                 | 688 |          |
| 5                 | 661 | 4        |
| 10                | 650 | 5.6      |
| 17                | 640 | 7.1      |
| 24                | 633 | 8.1      |
| Hrs back on wheat | WT  |          |
| 6                 | 687 |          |
| 25                | 694 |          |

<sup>a</sup>Source: Cravey et al., 1991

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result of extra-cellular and intra-cellular fluid loss. Tissue shrink is generally associated with long periods without feed and water (i.e. long hauls). Table 2 shows results of an Iowa experiment where thirty 600-pound steers were harvested at the Texas origin and thirty herdmate steers were harvested after a 24-hour haul to Iowa. Notice that approximately one-half the weight loss was from gut fill and the other half was from a reduction in weight of various body and carcass components. The authors were not able to account for an additional 2 to 2.5% weight loss. It was thought that this unaccountable loss was primarily due to a reduction in blood volume. Cattle take longer to recover from tissue shrink than from fill shrink. These two types of shrink probably don't occur independently. Fill shrink occurs first, but as time goes on, tissue shrink accounts for increasingly more of the weight loss.

## Factors That Affect Shrink

### Type of Feed

Cattle on lush green grass will shrink more than if they were consuming a less digestible, dried grass or hay. For example, a Montana study found that cattle off of dry pasture shrank 3.5% after a two-hour haul compared to 5.3% for animals off of lush, green forage. Cattle that were conditioned with grass hay before hauling were found to shrink less than if removed directly from wheat pasture prior to shipment (Table 3). Shrinkage from native hay was less than from alfalfa. Avoid a change of diet at shipping time unless the

**Table 2. Sources of weight change in yearling feeder steers during 24-hour shipment<sup>a</sup>**

| Source of Shrink | % of Weight Loss |
|------------------|------------------|
| Digestive Tract  |                  |
| Fill             | 3.2              |
| Tissue           | 0.4              |
| Carcass          | 1.9              |
| Hide             | 0.6              |
| Pluck            | 0.2              |
| Head             | 0.1              |
| Shank            | 0.1              |
| Total            | 6.5              |

<sup>a</sup>Source: Self and Gay, 1972

**Table 3. Shrink of wheat pasture cattle when returned to wheat or maintained for 24 hours in drylot with hay and water access<sup>a</sup>**

| <i>Treatment</i>       | <i>% Shrink after 4 hours trucking</i> |
|------------------------|--|
| Control, wheat pasture | 5.1                                    |
| Drylot, hay-fed        | 3.9                                    |

<sup>a</sup>Source: Cravey et al., 1991

change is made soon enough to give animals a chance to adjust to the new diet. Recent information from an Arkansas study indicates that ionophores, such as Bovatec<sup>®</sup> and Rumensin<sup>®</sup> have little influence on the amount of shrink cattle experience.

### Gathering and Sorting

The mere process of weighing cattle will cause shrink. However, quiet handling techniques can minimize weight loss. By training cattle to come to a feed truck or by pouring sacked feed on the ground before weigh day, cattle can be moved more easily to the sorting and loading site. If cattle are fairly close to the scales where they will be weighed, one can probably assume 2-3% shrink from actual pasture weight. This is quite variable, depending on how much handling, sorting, and crowding the cattle are subjected to, as well as loading time.

Cattle, at first daylight, have had little or no time to graze, whereas animals gathered in mid-morning have finished their major grazing period of the day and have watered. The time of the morning cattle are removed from pasture before weighing can affect animal weight and rate of shrink. A Kansas State study found that allowing cattle to graze until mid-morning not only resulted in heavier weights, but also reduced the rate of shrink (.86%/hr) during the first few hours after they were gathered (Table 4). In this work, cattle gathered at 9 a.m. and sold at 3 p.m. have significant added value (from the sellers perspective) compared to calves gathered early in the morning. A logical question that needs to be addressed is how much feed or forage is required to compensate for the greater shrink observed in early gathered cattle? Secondly, is the weight replacement more or less costly than the value of the shrink? If the 33 pounds of additional weight loss of early

**Table 4. Effects of gathering time of grazing yearling steers on shrink and sale value<sup>a</sup>**

|                                   | <i>Gathering Time</i> |               |               |               |
|-----------------------------------|-----------------------|---------------|---------------|---------------|
|                                   | <i>6 a.m.</i>         | <i>7 a.m.</i> | <i>8 a.m.</i> | <i>9 a.m.</i> |
| Off pasture weight, lb            | 681                   | 684           | 687           | 695           |
| Shrink to 3 p.m., %               | 6.2                   | 5.9           | 5.0           | 3.3           |
| Sale wt., lb                      | 639                   | 644           | 653           | 672           |
| Added value, \$/head <sup>b</sup> | -                     | 2.75          | 7.70          | 18.15         |
| Total value, \$/head <sup>c</sup> | 555.93                | 558.68        | 563.63        | 574.08        |

<sup>a</sup>Source: Coffey et al., 1997

<sup>b</sup>Added value calculated as \$.55 times pounds of added sale weight

<sup>c</sup>Total value determined as 639 times \$.87 plus added value

gathered cattle compared to late gathered cattle is strictly gut fill, a palatable ration costing \$140 per ton would replace the fill for a cost of \$2.31.

Anytime cattle are moved under stressful conditions, they experience weight loss. For example, for every 30 minutes that a group of cattle are moved around in a corral, expect an additional .5% weight loss. Consequently, cattle buyers don't complain when the seller has inadequate facilities. Nor do they mind long delays while cattle are sorted by means of yelling, ropes, dogs, sticks, whips, etc. If animals that will not be sold can be identified ahead of sale day, they should be sorted off one or two weeks in advance of weigh day. This allows sale cattle to regain their shrink and be moved onto the truck without interruptions.

### Weaning

One of the most stressful periods in the life cycle of beef cattle is weaning. Unfortunately, this stressful event often coincides with marketing, which can be another stressful period due to the handling, shipping, fasting, and commingling that is often involved. Freshly weaned calves are stressed enough that they have no desire to feed or even water, although the ration offered may be something they are accustomed to consuming. Consequently, great care must be taken in minimizing shrink when calves are marketed at the time of weaning. Table 5 includes data from an Oklahoma study where different weaning times were compared prior to a simulated sale or auction event. Calves that were weaned 22 days prior to the simulated sale were fed bermudagrass

**Table 5. Weight changes of calves that were preconditioned, or weaned and overnighed prior to sale, or weaned the day of sale**

| <i>Item</i>   | <i>Weaned<br/>22 days<br/>before sale</i> | <i>Weaned<br/>day before<br/>sale</i> | <i>Weaned<br/>day of sale</i> |
|---|---|---------------------------------------|-------------------------------|
| Preconditioning period,<br>22 days <sup>b</sup> , lbs                 | 43  | 37                                    | 33                            |
| Previous afternoon to<br>sale morning <sup>c</sup> , lbs              | -1  | -16                                   | -2                            |
| Sale morning to sale<br>time <sup>d</sup> , lbs                       | -11                                       | -10                                   | -15                           |
| 24 hour shrink prior to sale<br>time, % of body weight                | 2.3                                       | 4.9                                   | 3.4                           |
| Total weight change, start<br>of preconditioning to<br>sale time, lbs | 31  | 11                                    | 16                            |
| Total weight change,<br>% of body weight                              | 6.0                                       | 2.1                                   | 3.2                           |

<sup>a</sup>Source: Barnes et al., 1990

<sup>b</sup>Oct. 4 - Oct. 25

<sup>c</sup>Oct 25 (3:30 p.m.) - Oct. 26 (9:15 a.m.)

<sup>d</sup>Oct 26 (9:15 a.m. - 3:15 p.m.)

hay and four pounds per day of a concentrate feed supplement. At approximately 3:30 on the day prior to simulated sale, all calves were weighed and a second treatment group was weaned and provided free choice access to hay and water. All calves were weighed again at 9:15 a.m. the following morning and the third group was sorted (weaned) from the cows. All calves were penned in tight confinement from 9:15 a.m. to 1:15 p.m. to simulate shipment and handling at the auction yard. All calves were reweighed at 1:15 and provided free-choice access to hay and water. Calves were reweighed at 3:15 to simulate the auction event.

Results of this study indicate that preconditioning calves can add additional sale weight and minimize shrink in calves. Additionally, sorting and hauling freshly weaned calves to the sale facility the day before the auction could result in increased shrink, compared to preconditioned calves or calves weaned the day of sale. In some cases, shrink in newly weaned calves may be as high as 8% if they are forced to stand in the yard for several hours or overnight.

## Length of Haul

Obviously, time and distance are important factors. The greatest weight loss occurs during the first few miles and hours of transport. Table 6 summarizes the results of a Wyoming study with feeder cattle handled under various conditions.

Transit time appears to have the greatest influence on gross shrink. However, one can expect around 2% more shrink when cattle are being transported compared to a drylot stand of equal duration. Shrink occurs rapidly during the early part of transport, levels off, and then gradually increases. Cattle will lose approximately 1% of their body weight per hour for the first three to four hours and then .25% an hour for the next eight to ten hours. In an extensive Iowa study, cattle lost an additional .61% of their pay weight (at origin) for each additional 100 miles hauled. The range in shipping distance was approximately 500 to 900 miles.

## Conditions of Haul

Just loading and hauling a short distance can reduce weight by 3%. Loading too many cattle on a truck or trailer will result in even more weight loss. Overcrowding causes stress and occasional injury. Under-loading also causes excessive movement, which can lead to injury and added weight loss. When properly loaded, animals will fit easily into the compartment for hauling, but the entire area will appear occupied. Experienced truckers are a good source of information about the number of cattle of a given weight that should be safely loaded.

**Table 6. Effect of drylot stand or shipment on shrink in yearling steers<sup>a</sup>**

| <i>Conditions</i>    | <i>Percent Shrink</i> |              |
|----------------------|-----------------------|--------------|
|                      | <i>Drylot</i>         | <i>Truck</i> |
| 8 hrs. drylot stand  | 3.3                   | 5.5          |
| 16 hrs. drylot stand | 6.2                   | 7.9          |
| 24 hrs. drylot stand | 6.6                   | 8.9          |

<sup>a</sup>Source: Tippetts et. al.

Other factors that affect the amount of shrink include whether the truck is covered, if there is a good footing, and the total number of cattle to be shipped. There is less loss with a covered trailer. Sand at least 1 inch deep reduces shrink and injury in trailers with a slick floor. The size of the group transported for market doesn't affect shrink except for the additional time required to weigh and load large shipments.

## Unusual Conditions

Some conditions are beyond control. A bad storm, an unusually hot day, bad tasting water at the market, and bad road conditions are generally unpredictable; however, careful planning and management can provide some control over other unusual conditions that affect shrinkage. Observe weather forecasts when marketing cattle. Accompany cattle on their trip, making sure they are handled gently, provided with quality feed and clean water, and not delayed enroute or at the market. Make sure holding pens, loading chute, and scales are in good condition and use only experienced truckers with relatively new equipment.

## Rate of Gain, Age, and Body Composition

Studies do not show a relationship between rate of gain in the feedyard and subsequent shrink during marketing. Animals that shrink excessively regain relatively large amounts and animals that shrink lightly gain back small amounts. Feeder cattle shrink about 25% more than finished cattle on long hauls. Highly finished cattle shrink less than cattle with less finish, but net shrink (weight after fill-back) shows little difference. Shrinkage does not seem to be closely associated with weight of cattle, except when weight is correlated with the degree of fatness.

## Recovery Time

Many factors will influence the time required for cattle to regain gut fill and tissue shrink. A few of these factors include amount of shrink, type of shrink, cattle health, type of ration, and weather conditions. As shown in Table 1, for cattle that are consuming a high moisture diet and experience primarily fill shrink, recovery time will be minimal. Cattle that are subjected to considerable tissue shrink coupled with continuing sources of stress (sickness, commingling, a new ration), however, will require several days, even weeks, to regain their pre-market weight. In a very extensive Iowa experiment, cattle shipped from auction yards shrank more, but required about the same length of time to regain pre-shipment weight as cattle shipped directly from ranches (Table 7).

The data in Table 8 indicate that cattlemen should expect considerable variation in weight loss as well as the rate of recovery within a pen or load of cattle. Cattle in this project had grazed fescue pastures prior to being gathered early on the morning of shipment. Cattle were weighed individually and immediately loaded onto the truck. The truck was then weighed locally (approximately 20 minutes later) prior to a five-hour haul to the feedyard. Upon arrival at the feedyard, the cattle were unloaded and immediately weighed individually. Cattle had access to grass, hay, and water in a small grass trap overnight. After being processed on the morning after shipment the cattle were provided free-choice access to a corn, cottonseed hull, and supplement based ration. Indi-

**Table 7. Shrink and recovery time for cattle shipped directly from ranches or auction yards**

| Item                                | Shipped    |                   |
|-------------------------------------|------------|-------------------|
|                                     | From Ranch | From Auction Yard |
| Number of truck loads               | 38         | 15                |
| Avg. shipping weight, lb.           | 584        | 603               |
| Avg. distance shipped, miles        | 591        | 761               |
| Avg. shrink, %                      | 7.2        | 9.1               |
| Days to recover shipping weight     | 10.4       | 10.9              |
| Correlation of distance to % shrink | .72        | .44               |

Source: Self and Gay, 1972

**Table 8. Variation of shrink and recovery in yearling feeder cattle after<sup>a</sup> five-hour haul**

| Time of weight          | Weight, lb.<br>Avg | —Weight change, lb.— |              |              |      |
|-------------------------|--------------------|----------------------|--------------|--------------|------|
|                         |                    | Avg<br>(lbs)         | Max<br>(lbs) | Min<br>(lbs) | (%)  |
| Ranch,<br>early morning | 717                |                      |              |              |      |
| Local truck<br>scales   | 713                | -4                   |              |              |      |
| Arrival at<br>feedyard  | 670                | -47                  | -59          | -30          | -6.5 |
| 24 Hrs                  | 670                | -47                  | -82          | -20          | -6.5 |
| 72 Hrs                  | 655                | -62                  | -102         | -17          | -8.6 |
| Day 7                   | 720                | +3                   | -48          | +56          | +0.4 |
| Day 14                  | 762                | +45                  | 0            | +87          | +6.3 |

Source: Lalman et al., 1994

vidual weights were recorded at 24 hours, 72 hours, 7 days and 14 days after shipment. No cattle were determined to be sick at any time during the study.

Weight loss during shipment was very consistent, ranging from 39 to 50 pounds per head. However, the range in weight change increased over the following time periods. This suggests that some cattle began consuming feed or water or both sooner than others, or that some cattle experienced a greater degree of stress, for whatever reason. On average, this group of cattle had regained their preshipment weight by day 7, while one steer was still 48 pounds lighter and one steer was 56 pounds heavier.

In summary, the amount of shrink cattle experience varies tremendously and is influenced by many factors. Cattle buyers and sellers are challenged with being knowledgeable of these factors and managing them when possible in order to minimize the influence on sale conditions and cattle health.

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