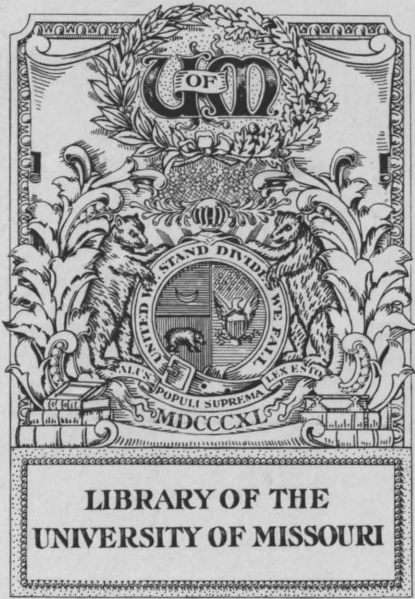


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S T E E R F E E D I N G

Wintering Yearling and Two Year Old Steers.

Residual Effect of Wintering Rations on Rate and Economy of
Subsequent Gains.

Influence of Age on Rate and Economy of Gains.

By

Henry Perly Rusk, B. S. Agr. University of
Missouri, 1908.

Thesis

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It is a common practice among Missouri Stockmen to buy stocker and feeder cattle in the fall, carry them thru the winter on relatively cheap feeds and full feed them on grass the following summer. The experience of practical feeders and the results obtained at this Station (Mo. Bul. No. 76) demonstrate that, at prevailing rentals for good blue grass pasture, cheaper gains can be made by summer feeding on grass than by full feeding in dry lot. It has also been shown (Mo. Bul. No. 75) that the maximum results from grazing can not be obtained unless cattle have been wintered so that they go on grass in relatively thin condition or at least carrying very little fat. The market value of stocker and feeder cattle suitable for grazing or full feeding on grass is usually \$.50 to \$1.00 per cwt. less in the fall than the following spring when the pasture season opens. This margin is not large but it is sufficient to make possible the utilization of much coarse and otherwise unmarketable roughage in such a way that a fair value will be received for it and a large part of the fertility contained in it retained upon the farm.

In the light of these facts it seems that, where an abundance of cheap roughage and good pasture is obtainable, the present custom of buying stocker and feeder cattle in the fall and wintering on cheap maintenance rations, in order to secure maximum results on pasture the following summer, is good practice. But the wide variations in the amounts and kinds of feeds used by different men in wintering similar steers, under

almost identical conditions, indicate that there is need for some definite information on the relative efficiency of various rations for wintering steers and the residual effects of these rations on the capacity of the steers to make rapid and economical gains when full fed on grass the following summer. In order to secure some data on this subject the Missouri Experiment Station conducted the feeding trials reported in this thesis.

PLAN OF EXPERIMENT.

This experiment was planned to throw some light on the following phases of beef production:

1. The value of various combinations of shelled corn, cowpea and corn silage, clover hay and wheat straw, for wintering steers.

2. The residual effect of the wintering rations on the capacity of the steers to make rapid and economical gains the following summer.

3. The value of silage as a roughage in a fattening ration for yearling and two year old steers.

4. The influence of age on the rate and cost of gains.

Nine lots of steers were used - four lots of two year olds and five lots of yearlings. The lot numbers of the yearlings were 1 - 5 inclusive, those of the two year olds were 6 - 9 inclusive. There were five steers in each lot except lot 5 of the yearlings in which there were six steers. Four lots of each age were fed comparable rations as follows:

| Yearlings Lot No. | Two year olds Lot No. | Ration |
|----------------------|--------------------------|---|
| 1 | 6 | Silage and clover hay. |
| 2 | 7 | 6# shelled corn, silage and clover hay. |
| 3 | 8 | 6# shelled corn, clover hay. |
| 4 | 9 | Silage and wheat straw. |
| 5 | | Winter pasture. |

Lot 5, which was wintered on blue grass pasture, received a small allowance of clover for a few days during January and February when the blue grass was completely covered with snow.

At the close of the wintering experiment all lots were full fed on blue grass pasture except lots 2 and 7, which had received shelled corn, silage and clover hay during the winter. These two lots were considered too fat to make the most economical use of grass, and were finished in dry lot on a ration of shelled corn, linseed oil meal, silage and clover hay. The grain ration in all the lots consisted of eight parts shelled corn and one part linseed oil meal.

METHOD OF FEEDING.

The method of feeding during the wintering experiment was practically the same for both yearlings and two year olds. The shelled corn was fed in bunks in the open lot, about 7:30 A. M. The silage was fed in the same bunks about 5:30 P. M. The wheat straw and clover hay were fed in mangers under the shed and kept before the cattle at all times. During the summer feeding trial, the two lots of steers finished in dry lot were fed in practically the same manner as during the winter, except linseed oil meal was mixed with the shelled corn. The lots finished on grass received shelled corn and linseed oil meal in bunks about 7:30 P. M. All feeds not consumed were weighed back and not considered in the experiment.

The feed bunks used in this experiment were alike and were ordinary, flat bottom bunks, about 3 feet wide, 8 inches deep, 12 feet long and 2 feet high. They were all placed out in the open.

QUALITY AND PRICES OF FEEDS USED.

Shelled Corn. The corn was purchased from farmers in the vicinity of the University and was considerably above the average Missouri corn in quality, being dry and practically free from rotten or mouldy grains. The farm prices for corn in the neighborhood of the University almost doubled during the course of the experiment, and the price of 50¢ per bushel used for figuring the results of this experiment is not based upon the actual market value of the corn fed, but is what was considered a liberal estimate for corn one year with another.

Linseed Oil Meal. The linseed oil meal was "old process" meal of good quality and is figured in this experiment at \$32.00 per ton.

Clover Hay. It was found practically impossible to secure choice, clear, clover hay but most of the clover used, although not bright, was fairly palatable. It contained small amounts of timothy but the proportion of timothy to clover was so small that it is not considered. \$8.00 per ton was taken as the farm value of clover hay.

Silage. The silage fed in this experiment was put up in the large stone silo at the beef cattle barn on the

University Farm. It was mixed corn and cowpeas in varying proportions from straight corn in the bottom to straight cowpeas at the top. As it was not thought at the time this silage was put up that it would be used for experimental purposes no record was kept of the exact amount of either corn or cowpeas put in. The corn was not over ripe but a large quantity of water was used especially around the edges of the silo.

In order to secure samples of silage from which to determine the exact proportions of corn and cowpeas and the amount of moisture contained in the silage fed, a ten gallon air tight glass jar was placed in the barn near the silo and the feeder was instructed to put a representative handful of silage from each feed in this jar. A few drops of formaldehyde were put in the jar to prevent any possible decomposition. The straight cowpeas lasted just twenty days. At the end of that time and at the end of every thirty day period thereafter, this jar containing the composite sample was taken to the laboratory where mechanical analysis were made to determine the proportion of cowpeas to corn in the silage. A portion of each sample was also air dried to determine the moisture content. The following table is a summary of the results obtained.

Table 1.

CORN, COWPEAS AND MOISTURE IN SILAGE.

| Date sample was brought in for analysis | On basis of fresh silage | | | Percent Moisture | Percent air Dry matter. |
|--|--------------------------|---------|------------|---------------------|-------------------------------|
| | Corn | Cowpeas | Impurities | | |
| Dec. 18 '08 | | 100% | | 81.55 | 18.45 |
| Dec. 28 '08 | 40.04% | 58.53% | 1.43 | 79.02 | 20.98 |
| Jan. 27 '09 | 57.00 | 43.00 | | 74.12 | 25.88 |
| Feb. 26 '09 | 70.23 | 29.77 | | 70.05 | 29.95 |
| Mar. 28 '09 | 93.33 | 6.67 | | 67.24 | 31.76 |
| Apr. 27 '09 | 94.00 | 6.00 | | 73.20 | 26.80 |
| June 9 '09 | 99.60 | .40 | | 70.50 | 29.50 |

It will be noticed that the proportion of moisture to air dry matter was rather high, especially so since the corn used was certainly ripe enough for silage. The feeders soon noticed that the silage from this silo seemed to contain much more acid than silage from the silo at the dairy. A chemical study of the silage showed that it required approximately 20 c.c. of $\frac{N}{10}$ Na O H to neutralize acid in 10 grams of fresh silage from the dairy silo, while it required approximately 25 c. c. of $\frac{N}{10}$ Na O H to neutralize 10 grams of fresh silage from the stone silo at the beef cattle barn. The samples for this determination were taken on January 19, 1909 when the amounts of corn and cowpeas in the silage were about equal. The silage is valued at \$3.00 per ton.

Wheat Straw. The wheat straw used in this experiment was clean and bright but a little coarse. It was valued at \$3.00 per ton.

Pasture. The winter pasture was a luxuriant fall growth of blue grass in the experimental pastures on the University Farm. With the exception of a few days when the grass was covered with snow this pasture furnished an abundance of feed thruout the winter. The winter pasture is charged at \$1.00 per steer per month. The summer pasture was exceptionally good blue grass pasture and there was a great deal more than the steers needed. There was also considerable orchard grass in some parts of the pastures but that came on early and soon got so coarse that the steers did not relish it. The summer pasture is charged at .75¢ per head per month for the two year olds and \$1.00 per head per month for the threes.

SHELTER, FEED LOTS AND WATER SUPPLY.

The dry lot feeding was done in the University experimental shed. This shed stands east and west and opens on the south into lots 100 feet long and 18 feet wide. The shed itself is divided into compartments 18 feet wide and 20 feet deep, corresponding to the lots on the south. On the north side of the shed is a feed alley and manger for hay and other roughages. Each lot had a galvanized iron water tank placed under the shed and was supplied with water from the University deep wells. Each tank was protected in cold weather by manure packed around the sides and held in place by wooden walls. The tanks were also

fitted with covers so that they could be closed during exceptionally cold weather or before weighing. The ground in these lots sloped gently to the south which gave good drainage. The soil was also slightly rounded up in the center of the lot, but in spite of this precaution the mud became very bad during freezing and thawing weather.

The yearlings, which were wintered on blue grass pasture, had no shelter except what they could get in ravines and from scattering trees. Their water came from the spring on the east end of golf links. During the coldest weather holes were chopped in the ice every day.

The summer pastures had no shelter except that afforded by trees but were furnished with galvanized tanks which were supplied with water from the University deep wells.

WEIGHTS.

In order to simplify records and make it possible to identify individual steers, each was given a numbered tag, which was fastened to a strap worn around the steer's neck. Individual weights were taken on three consecutive days at the beginning and at the close of each experiment and the averages taken as the initial and final weights of the trial. Individual weights were also taken on the first day of each 30 day period. The weights were all taken after the morning feed. The covers on the water tanks at the shed were always closed at 6 P. M. the evening before weigh day. The steers on pasture were always

weighed after those at the shed had been weighed. No attempt was made to keep these steers off water before weighing because there was running water in every lot.

DESCRIPTION OF CATTLE.

Yearlings. There were 36 yearlings used in this experiment. One of this number was a pure-bred Hereford raised by the College. The remaining 35 were grade Herefords raised in Callaway county Missouri and purchased by Mr. Robinson for the University. They were driven from Callaway county to Mr. Robinson's farm near Columbia about the 20th of November, 1908, and kept there until the day before the experiment started. During the time the steers were on Mr. Robinson's farm they received mixed timothy and clover hay ad libitum. At the time they arrived at the Station their hides were tight and stiff and their coats dull and harsh, showing the effects of rather poor rations and the hard drive from Callaway. Five of them had just recently been dehorned and that also detracted from their bloom. They were in thin condition and would have graded as good light stockers.

Two Year Olds. The two year olds used in this trial were 20 head of high grade Herefords that had been purchased as calves by the University in the fall of 1906. They were full fed from December 6, 1906 to May 3, 1907. From the latter date until the beginning of this experiment they were on pasture continually, received no extra feed except a maintenance ration of mixed hay

when snow covered the grass. They were a very uniform lot, all being out of good grade cows and sired by pure bred Hereford bulls. At the time this experiment started they averaged about 1100 pounds in weight and would have graded as choice, heavy, fleshy feeders. They carried more flesh and showed considerable better breeding and quality than the yearlings.

VALUES OF CATTLE.

At the beginning of the experiment both yearlings and two year olds were divided into lots as nearly equal in respect to size, conformation, quality and condition as possible. The yearlings were valued at \$4.25 per cwt. and the two year olds at \$5.00 per cwt., which were representative farm prices for those two classes of cattle in Missouri at that time. At the end of the winter feeding trial Mr. Alexander of Chicago valued each lot as it would sell on the Chicago market. From this price \$.50 per cwt. was deducted to cover shrinkage, freight, feed, yardage and commission, in order to secure a valuation based on home weights. This value is used as the final value of the steers in the wintering trial and the initial value in the full feeding trial which followed. The final values for the latter trial are based on the actual selling prices of each lot of steers on the Chicago market. However, three steers which had been poor doers, were sold separately and their actual selling prices were not considered in figuring out the experimental results because they were not representative steers and their poor condition was not due to rations fed.

HOGS.

No reliable data were secured on the amount of pork that should have been produced from the droppings of these cattle. Hogs were placed in all lots but cholera got into the herd and several of the hogs died. All statements of profit and loss made in this report are made without any reference to pork produced.

PART 1.

WINTERING YEARLING AND TWO YEAR OLD STEERS.

WINTERING YEARLING STEERS.

From the nature of the rations used, there was little likelihood of trouble in getting the steers accustomed to their feeds and with the exception of the silage a full allowance of the regular rations, as planned for the experiment, was given to the steers at once. Steers have been started on amounts of corn silage several times as large as the initial feed of silage in this experiment and no detrimental effects noted. But since the first silage used in this experiment was straight cowpea silage and little was known about getting cattle accustomed to it, considerable care was exercised in getting the steers on a full allowance. The first feed of silage was only 15 pounds to the lot or 3 pounds per head. Every steer in the experiment ate silage the first time it was put before them. From that time on, the silage allowance was increased 5 pounds per lot almost every day until the end of the first 30 day period when all the yearlings receiving silage got 110 pounds per lot or 22 pounds per steer. At the beginning of the second 30 day period the allowance was increased to 120 pounds per lot or 24 pounds per head. This was as much as they would clean up readily at one feed and the amount was not changed until the beginning of the third 30 day period, then it was raised to 26 pounds per steer where it remained in all lots, except No. 2, until the close of the experiment. About March 5th the steers

in Lot No. 3 began leaving a little silage in their feed bunk until the morning after it was fed and their allowance was reduced, March 9th, to 25 pounds per head for the remainder of the experiment.

Table 3.

DAILY CONSUMPTION PER STEER BY PERIODS.

| Lot No. | Feeds | Periods. | | | | |
|---------|--------------|----------|-------|-------|-------|-------|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Silage | 10.50 | 24.00 | 26.00 | 26.00 | 26.00 |
| | Clover hay | 12.24 | 9.41 | 8.20 | 9.92 | 9.49 |
| 2 | Shelled corn | 6.00 | 6.00 | 6.00 | 6.00 | 6.00 |
| | Silage | 10.50 | 24.00 | 26.00 | 25.36 | 25.00 |
| | Clover hay | 11.45 | 8.55 | 8.23 | 7.65 | 8.45 |
| 3 | Shelled corn | 6.00 | 6.00 | 6.00 | 6.00 | 6.00 |
| | Clover hay | 14.51 | 15.59 | 14.40 | 18.49 | 16.91 |
| 4 | Silage | 10.50 | 24.00 | 26.00 | 26.00 | 26.00 |
| | Wheat straw | 9.57 | 5.79 | 3.72 | 2.49 | 2.00 |

Table 3 shows the average amount of feed consumed per steer by 30 day periods. It will be observed that the clover hay consumed in lots No. 1 and No. 2 decreased as the amount of silage consumed increased. After the consumption of silage reached the maximum, there was a slight increase in the amount of clover hay consumed. In lot No. 3 there was a marked increase in the daily consumption of clover hay during the experiment. It will also be noted that in Lot 4, which received wheat straw and silage, there was a continual decrease in the daily consumption of wheat straw even after the consumption of silage had reached the maximum,

indicating that the wheat straw was not palatable and that the steers were becoming tired of it.

Table 3. - SHOWING THE VALUE OF DIFFERENT RATIONS IN
WINTERING YEARLING STEERS.

Nov. 28, 1908 - April 27, 1909 - 150 days.

| Lot No. | 1 | 2 | 3 | 4 | 5 |
|---------------------------------|----------|----------|----------|-----------|-----------------------------------|
| Number of steers. | 5 | 5 | 5 | 5 | 6 |
| Initial value per cwt. | \$4.25 | \$4.25 | \$4.25 | \$4.25 | \$4.25 |
| Average Initial weight. | 646# | 689# | 712# | 683# | 690 ⁵ / ₈ # |
| Average final weight. | 777# | 964# | 911# | 667# | 788 ¹ / ₃ # |
| Total gain per steer | 131# | 275# | 199# | -16# | 97 ¹ / ₂ # |
| Average daily gain. | .87# | 1.83# | 1.32# | -.10# | .65# |
| Total feed consumed | lbs. | lbs. | lbs. | lbs. | lbs. |
| shelled corn | | 4500 | 4500 | | |
| silage | 16875 | 16606 | | 16875 | |
| clover hay | 7389 | 6648 | 12061 | | 1415 |
| wheat straw | | | | 3516 | |
| Average daily ration | lbs. | lbs. | lbs. | lbs. | lbs. |
| shelled corn | | 6.00 | 6.00 | | |
| silage | 22.50 | 22.14 | | 22.50 | |
| clover hay | 9.85 | 8.86 | 16.40 | | 1.57 |
| wheat straw | | | | 4.69 | Pasture |
| Feed per pound gain | lbs. | lbs. | lbs. | lbs. | lbs. |
| shelled corn | | 3.27 | 4.52 | | |
| silage | 25.76 | 12.08 | | loss | |
| clover hay | 11.28 | 4.83 | 12.12 | in | 2.41 |
| wheat straw | | | | weight | |
| Total cost of feeds | \$54.87 | \$91.68 | \$88.42 | \$30.58 | \$35.66* |
| Cost of gains per cwt. | \$ 8.377 | \$ 6.66 | \$ 8.89 | loss | \$ 6.095 |
| Necessary selling price | \$ 4.946 | \$ 4.939 | \$ 5.263 | \$ 5.268 | \$ 4.478 |
| Final value in lots per cwt. | \$ 4.90 | \$ 5.50 | \$ 5.25 | \$ 4.70 | \$ 4.80 |
| Profit per lot. | \$-1.78 | \$27.008 | \$- .583 | \$-18.972 | \$15.218 |
| Profit per steer. | \$ -.356 | \$ 5.40 | \$- .117 | \$- 3.794 | \$ 2.536 |

* \$1.00 per head per month for pasture included.

Table 3 contains the tabulated results of the wintering experiment with yearling steers. It will be noticed that the ration of cowpeas and corn silage, once per day, and clover hay ad libitum, fed lot No. 1, not only maintained the live weight of the steers but produced an average daily gain of .87 pounds per steer. A comparison of lots No. 1 and No. 2 shows that the addition of 6 pounds of shelled corn per head to the daily ration caused a slight reduction in the consumption of silage and clover hay. It also increased the average daily gain almost a pound per steer. The cost of gains was \$1.717 per cwt. less in lot No. 2 than in lot No. 1, showing that the addition of 6 pounds of shelled corn to a ration of cowpea and corn silage and clover hay materially decreases the cost of gains. The necessary selling price, on the basis of final weights in lots without shrink, was almost the same in both lots, but the actual final values in lots were \$.60 per cwt. in favor of the lot receiving the shelled corn. The actual margin per cwt. secured in lot No. 1 was \$.65 which was \$.046 less than was necessary to break even, netting a loss of \$.356 per steer; while the actual margin in lot No. 2 was \$1.25 per cwt., netting a profit of \$5.40 per steer.

A comparison of lots No. 2 and No. 3 in table 3 shows that the addition of cowpea and corn silage to the ration of shelled corn and clover hay, increased the average daily gain about one-half pound per steer and reduced the cost of gains

\$2.23 per cwt. It also reduced the total consumption of clover almost one-half. A comparison of the necessary selling prices in these two lots shows that the addition of silage to the ration decreased the necessary margin required to break even, while the final valuations show that the silage fed steers were worth \$.25 per cwt. more than the others at the end of the trial. The table also shows that the lot receiving silage returned a profit of \$27.00 while the lot which received the same ration without silage lost \$.58. The steers in lot No. 4 which received silage and wheat straw lost 16 pounds per head during the experiment. A comparison of lots No.1 and No. 4 shows that clover hay gave much more economical results; the steers receiving clover making fair gains in weight and coming out of the experiment in much better condition than those receiving wheat straw. Lot No. 5 which ran on blue grass pasture during the winter made small gains during December and lost 78 pounds per head during January and February but more than gained it back during March and April. They came thru the winter in good stocker condition and appeared much more thrifty at the end of the experiment than they did at the beginning.

WINTERING TWO YEAR OLD STEERS.

The two year old steers were fed rations similar to those fed the yearling steers and the same care was exercised in getting them accustomed to these feeds. They were started on 15 pounds of cowpea and corn silage per lot and gradually increased until the beginning of the second 30 day period when they were getting 130 pounds per lot or 26 pounds per steer. This was all the steers in lot No. 7 would clean up readily and as it was desired to keep the consumption of silage about the same in all lots, there was no further increase in the allowance until the beginning of the third 30 day period; then it was increased to 27 pounds per steer where it remained until the close of the experiment.

Table 4. - DAILY CONSUMPTION PER STEER BY 30 DAY PERIODS.

| Lot. No. | Feeds. | Periods | | | | |
|-------------|--------------|---------|-------|-------|-------|-------|
| | | 1 | 2 | 3 | 4 | 5 |
| 6 | Silage | 11.40 | 26.00 | 27.00 | 27.00 | 27.00 |
| | Clover hay | 17.85 | 15.56 | 16.16 | 19.40 | 15.69 |
| 7 | Shelled corn | 6.00 | 6.00 | 6.00 | 6.00 | 6.00 |
| | Silage | 11.4 | 26.00 | 27.00 | 27.00 | 27.00 |
| | Clover hay | 16.35 | 10.96 | 12.37 | 11.99 | 9.73 |
| 8 | Shelled corn | 6.00 | 6.00 | 6.00 | 6.00 | 6.00 |
| | Clover hay | 16.92 | 19.86 | 20.84 | 22.66 | 20.76 |
| 9 | Silage | 11.40 | 26.00 | 27.00 | 27.00 | 27.00 |
| | Wheat straw | 11.26 | 9.16 | 8.706 | 7.346 | 6.926 |

Table 4 shows the average daily consumption per steer by 30 day periods. It will be noted that in a general way the consumption of clover hay decreased as the allowance of silage increased. However there is a very noticeable increase in consumption of clover hay during the third and fourth 30 day period. This is explained by the fact that an exceptionally fine lot of bright clover was secured about that time. A comparison of Lot No. 9 in table 4 with lot No. 5 in table 2 shows that the two year old consumed much more wheat straw than the yearlings and that the average daily consumption did not decrease nearly so fast in the case of the two year olds as with the yearlings. In fact a comparison of the two tables demonstrates that the two year olds consumed much more clover hay and wheat straw than the yearlings but did not appear to be able to handle very much more silage than the yearlings.

Table 5 summarizes the results of the wintering experiment with two year olds. As was the result in the experiment with yearlings all lots more than maintained their weight except the one receiving cowpea and corn silage and wheat straw. However the gains made by the two year olds were not as large as those made by the yearlings. This is contrary to results secured in other experiments conducted at this Station but is explainable by the fact that the two year olds were much fleshier than the yearlings at the beginning of this experiment. A comparison of lots No. 6 and No. 7 shows that the addition of 6 pounds of

shelled corn to a ration of silage and clover hay increased the average daily gain from .82 pounds to 1.45 pounds per steer and decreased the cost of gains from \$12.591 per cwt. to \$9.665 per cwt. The total cost of feeds was \$77.44 in lot 6 while it was \$104.87 in lot No. 7. However the better condition of the cattle fed shelled corn more than offset the extra cost of feed as shown in the final valuations per cwt. and consequent profits and loss. By comparing lots No. 7 and No. 8 it will be noted that the addition of cowpea and corn silage to a ration of shelled corn and clover materially decreased the consumption of clover hay, increased the rate of gain, and cheapened the cost of gains. The necessary selling price was \$.17 per cwt. less in lot No.7, which received silage, than in lot No. 8 and the final valuations were \$.15 per cwt. higher in the lot which received the silage, making a difference of \$20.42 profit and loss netted by the two lots. Lot No. 9, which received a ration of cowpea and corn silage and wheat straw, lost 21 pounds per head during the experiment. These steers grew some in stature or frame but became much thinner. The actual margin between the initial and final valuations in this lot was only \$.10 per cwt. Considering the loss in weight this margin made the steers worth only 1.4 cents more per head at the close of the experiment than at the beginning while the total cost of feeds amounted to \$7.282 per steer, netting a total loss of \$36.34 on the lot or \$7.268 per steer.

Table 5. - SHOWING VALUE OF DIFFERENT RATIONS FOR WINTERING
TWO YEAR OLD STEERS.
Nov. 28, 1908 - April 27, 1909 - 150 Days.

| Lot No. | 6 | 7 | 8 | 9 |
|---|-----------|----------|-----------|------------|
| Number of steers | 5 | 5 | 5 | 5 |
| Initial value per cwt. | \$5.00 | \$5.00 | \$5.00 | \$5.00 |
| Average initial weight | 1123 | 1056 | 1125 | 1085 |
| Average final weight | 1264 | 1273 | 1281 | 1064 |
| Total gain per steer | 123 | 217 | 156 | -21 |
| Average daily gain | .82 | 1.45 | 1.04 | -.14 |
| Total feed consumed | | | | |
| shelled corn | | 4500 | 4500 | |
| silage | 17760 | 17760 | | 17760 |
| clover hay | 12699 | 9512 | 15163 | |
| wheat straw | | | | 6512 |
| Average daily ration | | | | |
| shelled corn | | 6.00 | 6.00 | |
| silage | 23.68 | 23.68 | | 23.68 |
| clover hay | 16.93 | 12.68 | 20.22 | |
| wheat straw | | | | 8.68 |
| Feed per pound gain | | | | |
| shelled corn | | 4.15 | 5.77 | |
| silage | 28.88 | 16.37 | | loss |
| clover hay | 20.65 | 8.766 | 19.44 | in |
| wheat straw | | | | weight |
| Total cost of feeds | \$77.44 | \$104.87 | \$100.83 | \$36.41 |
| Cost of gains per cwt. | \$12.591 | \$ 9.665 | \$ 12.926 | |
| Necessary selling price | \$ 5.749 | \$ 5.795 | \$ 5.965 | \$ 5.783 |
| Rinal value per cwt.in lots without shrink | \$ 5.50 | \$ 6.00 | \$ 5.85 | \$ 5.10 |
| Profit per lot | \$-15.54 | \$ 13.03 | \$ -7.39 | \$- 36.34 |
| Profit per steer. | \$ -3.108 | \$ 2.606 | \$ -1.478 | \$ - 7.268 |

FINANCIAL STATEMENTS OF WINTERING EXPERIMENTS.

Lot 1 - Five Yearling Steers Wintered on Silage and Clover Hay.

| | |
|---|-----------------|
| To 5 steers, wt. 3230 @ \$4.25..... | \$137.275 |
| To 16875 lbs. silage @ \$3.00 per ton..... | \$ 25.31 |
| To 7389 lbs. clover hay @ \$8.00 per ton..... | <u>\$ 29.56</u> |
| Total expenditures | \$192.145 |

| | |
|-------------------------------------|------------------|
| By 5 steers, wt. 3885 @ \$4.90..... | <u>\$190.365</u> |
| Total loss..... | \$ 1.78 |
| Loss per steer..... | .356 |
| Loss per dollar invested..... | .0092 |

The steers in lot No. 1 not only came thru the winter in good thrifty condition but appeared to carry considerable more flesh than when put on the experiment and would have graded as choice feeders or common killers.

Lot No. 2 - Five Yearling Steers Wintered on Shelled corn, Silage and Clover Hay.

| | |
|---|-----------------|
| To 5 steers, wt. 3445 @ \$4.25..... | \$146.413 |
| To 4500 lbs. shelled corn @ .50¢ per bu..... | \$ 40.18 |
| To 16606 lbs. silage @ \$3.00 per ton..... | \$ 24.91 |
| To 6648 lbs. clover hay @ \$8.00 per ton..... | <u>\$ 26.59</u> |
| Total expenditures | \$238.093 |

| | |
|---|-----------------|
| By 5 steers, wt. 4820 @ \$5.50..... | <u>\$265.10</u> |
| Total profit..... | \$ 27.007 |
| Profit per steer..... | \$ 5.401 |
| Profit per dollar expended..... | \$.1134 |
| Price received per bu. of shelled corn fed... | .839 |

These steers were carrying considerable fat at the close of the experiment and would have graded as medium to good yearling heaves.

Lot No. 3 - Five Yearling Steers Wintered on Shelled Corn and
Clover Hay.

| | |
|--|-----------------|
| To 5 steers, wt. 3560 @ \$4.25..... | \$151.301 |
| To 4500 lbs. shelled corn @ 50¢ per bu..... | \$ 40.18 |
| To 12061 lbs. clover hay @ \$8.00 per ton..... | <u>\$ 48.24</u> |
| Total expenditures..... | \$239.72 |

| | |
|--|------------------|
| By 5 steers, wt. 4555 @ \$5.25..... | <u>\$239.137</u> |
| Total loss..... | \$.583 |
| Loss per steer..... | \$.117 |
| Loss per dollar invested..... | \$.00243 |
| Price received per bu. shelled corn fed..... | \$.4928 |

These steers were in good thrifty condition and carried some fat. They would have sold for good to choice feeders or good "handy dressed" beef steers.

Lot No. 4 - Five Yearling Steers Wintered on Silage and
Wheat Straw.

| | |
|--|------------------|
| To 5 steers, Wt. 3415 @ \$4.25..... | \$145.138 |
| To 16875 lbs. silage @ \$3.00 per ton..... | \$ 25.31 |
| To 3516 lbs. wheat straw @ \$3.00 per ton..... | <u>\$ 5.27</u> |
| Total expenditures | \$175.718 |
| By 5 steers, wt. 3335 @ \$4.70..... | <u>\$156.745</u> |
| Total loss..... | \$ 18.973 |
| Loss per steer..... | \$ 3.794 |
| Loss per dollar invested..... | <u>\$.1718</u> |

These steers were somewhat larger of frame and considerably thinner at the end of the experiment than at the beginning. However their coats had a bright appearance indicating health and vigor. They would have graded as good stockers.

Lot No. 5 - Six Steers Wintered on Blue Grass Pasture.

| | |
|---|-----------------|
| To 6 steers, wt. 4145 @ \$4.25..... | \$176.163 |
| To 1415 lbs. clover hay @ \$8.00 per ton..... | \$ 5.66 |
| To pasture @ \$1.00 per head per month..... | <u>\$ 30.00</u> |
| Total expenditures | \$211.823 |
| By 6 steers, wt. 4730 lbs. @ \$4.80..... | <u>\$237.04</u> |
| Total profit..... | \$ 15.218 |
| Profit per steer..... | \$ 2.536 |
| Profit per dollar invested..... | \$.0718 |

These steers were in good thrifty condition at the end of the experiment. They had developed long mossy coats during the winter which were very much better than coats of any under shed. They would have graded as good stockers.

Lot No. 6 - Five Two-Year Old Steers Wintered on Silage and
Clover Hay.

| | |
|--|------------------|
| To 5 steers, wt. 5615 @ \$5.00..... | \$280.75 |
| To 17.760 lbs. silage @ \$3.00.per ton..... | \$ 26.64 |
| To 12.699 lbs. clover hay @ \$8.00 per ton.... | <u>\$ 50.796</u> |
| Total expenditures. | \$358.186 |

| | |
|-------------------------------------|-----------|
| By 5 steers, wt. 6230 @ \$5.50..... | \$342.65 |
| Total loss..... | \$ 15.536 |
| Loss per steer..... | \$ 3.1072 |
| Loss per dollar invested..... | \$.0436 |

These cattle carried considerable flesh at the close of the experiment and would have graded as medium beef steers or poor export cattle.

Lot 7. - Five Two-Year Old Steers Wintered on Shelled Corn,
Silage, and Clover Hay.

| | |
|---|------------------|
| To 5 steers, wt. 5280 @ \$5.00..... | \$264.00 |
| To 4500 lbs. shelled corn @ 50¢ per bu..... | \$ 40.1785 |
| To 17760 lbs. silage @ \$3.00 per ton..... | \$ 26.64 |
| To 9512 lbs. clover hay @ \$8.00 per ton..... | <u>\$ 38.048</u> |
| Total expenditures | \$368.8665 |

| | |
|--|-----------------|
| By 5 steers, wt. 6365 @ \$6.00..... | <u>\$381.90</u> |
| Total profit..... | \$ 13.0335 |
| Profit per steer..... | \$ 2.6067 |
| Profit per dollar invested..... | \$.0353 |
| Price received per ^{bu.} lb. of shelled corn fed.... | \$.662 |

These steers showed considerable fat at the close of the experiment and would have sold on the Chicago market as medium to good beef or export steers.

Lot No. 8 - Five Two-Year Old Steers Wintered on Shelled
Corn and Clover Hay.

| | |
|---|-------------------|
| To 5 steers, wt. 5625 @ \$5.00..... | \$281.2500 |
| To 4500 lbs. shelled corn @ 50¢ per bu..... | \$ 40.1785 |
| To 15,163 lbs. clover hay, @ \$8.00 per ton.... | <u>\$ 60.6520</u> |
| Total expenditures | \$382.0805 |

| | |
|--|-------------------|
| By 5 steers, wt. 6405 @ \$5.85..... | <u>\$374.6925</u> |
| Total loss..... | \$ 7.3880 |
| Loss per steer..... | \$ 1.4776 |
| Loss per dollar invested..... | \$.0193 |
| Price received per bu. of shelled corn fed.... | \$.408 |

This lot of steers carried a little less fat than lot No. 7, but could not be classified much below that lot.

Lot No. 9 - Five Two-Year Old Steers Wintered on Silage
and Wheat Straw.

| | |
|---|-----------------|
| To 5 steers, wt. 5425 @ \$5.00 | \$271.250 |
| To 17,760 lbs. silage @ \$3.00 per ton..... | \$ 26.640 |
| To 6,512 lbs. wheat straw, @ \$3.00 per ton.. | <u>\$ 9.768</u> |
| Total expenditures , | \$307.658 |

| | |
|-------------------------------------|------------------|
| By 5 steers, wt. 5320 @ \$5.10..... | <u>\$271.320</u> |
| Total loss..... | \$ 36.338 |
| Loss per steer..... | \$ 7.267 |
| Loss per dollar invested..... | \$.1181 |

These steers had lost some in flesh during the winter, but were in strong healthy condition and would have sold as good to choice feeders.

PART 2.

RESIDUAL EFFECT OF WINTER RATIONS.

TWO YEAR OLDS.

The steers recorded in part 2 of this thesis as two year olds, are the same steers that are recorded as yearlings in the discussion on wintering steers. The numbers of the lots have not been changed and all lots may be identified in any part of this thesis by the lot number.

At the close of the wintering experiment, lots Nos. 1, 3, 4 and 5 were each placed on good blue-grass pasture and fed a grain ration consisting of 8 parts by weight of shelled corn and 1 part by weight of linseed oil meal. They were fed once per day and as soon as they became accustomed to their rations, they were fed all they would clean up in one-half to three-quarters of an hour. They were fed as nearly as possible under the same conditions so that the only varying factor of importance entering into the experiment was the residual effect of the winter rations. Lot No. 2 was considered too fat to make economical use of grass and was finished in dry lot.

Table 6 shows the average daily consumption of feeds by 30 day periods. A comparison of lots Nos. 1, 3, 4 and 5 will show the residual effect of winter rations on their appetite for shelled corn and linseed oil meal. It should be noted that the steers in lot No. 3, which were fed some shelled corn during the winter, were accustomed to corn when they went on grass and con-

Table 6. - AVERAGE DAILY CONSUMPTION BY 30 DAY PERIODS.

TWO YEAR OLDS.

| Lot No. | Feeds | Periods | | |
|---------|------------------|---------|--------|--------|
| | | 1 lbs. | 2 lbs. | 3 lbs. |
| 1 | Shelled corn | 6.506 | 9.28 | 12.53 |
| | Linseed oil meal | .813 | 1.16 | 1.567 |
| 2 | Shelled corn | 10.83 | 12.48 | 14.40 |
| | Linseed oil meal | 1.353 | 1.56 | 1.80 |
| | Silage | 26.000 | 25.73 | 20.46 |
| | Clover hay | 5.480 | 5.500 | 3.02 |
| 3 | Shelled corn | 10.83 | 11.36 | 14.13 |
| | Linseed oil meal | 1.353 | 1.42 | 1.77 |
| 4 | Shelled corn | 6.506 | 9.28 | 12.53 |
| | Linseed oil meal | .813 | 1.16 | 1.567 |
| 5 | Shelled corn | 6.755 | 9.67 | 11.77 |
| | Linseed oil meal | .844 | 1.33 | 1.47 |

sequently consumed much more than the other steers on pasture. This was especially true during the fore part of the experiment while the steers in other lots were becoming accustomed to their rations. The steers in lot No. 5, which had been on pasture, were not so hungry for grass as the cattle that came from dry lot and they took to their grain ration more readily than others that had not received grain during the winter. However there was one steer in lot No. 5 that did not seem to like corn and the lot dropped behind the others in average consumption of grain during the last month. Lot No. 2, which was finished in dry lot, consumed more grain than any other lot but that may be due as much to the immediate effect of grass on the capacity of the other steers as to the residual effect of the winter rations.

Table 7. - RESIDUAL EFFECT OF WINTER RATIONS ON CAPACITY OF STEERS TO MAKE RAPID AND ECONOMICAL GAINS THE FOLLOWING SUMMER.

| Lot No. | 1 | 2 | 3 | 4 | 5 |
|---|-----------|----------|----------|-----------|-----------------------------------|
| Number of Steers | 5 | 5 | 5 | 5 | 6 |
| Initial value per cwt. | \$4.90 | \$5.50 | \$5.25 | \$4.70 | \$4.80 |
| Average initial weight | 777# | 964# | 911# | 667# | 788 ¹ / ₃ # |
| Average final weight | 1041# | 1145# | 1173# | 1046# | 1080# |
| Total gain per steer | 264# | 181# | 261# | 379# | 291 ² / ₃ # |
| Average daily gain | 2.92 | 2.01 | 2.90 | 4.21 | 3.24 |
| Total feed consumed | | | | | |
| shelled corn | 4248 | 5656 | 5448 | 4248 | 4968 |
| linseed oil meal | 531 | 707 | 681 | 531 | 621 |
| silage | | 10829 | | | |
| clover hay | | 2040 | | | |
| Average daily ration | | | | | |
| shelled corn | 9.44 | 12.57 | 12.11 | 9.44 | 9.20 |
| linseed oil meal | 1.18 | 1.571 | 1.51 | 1.18 | 1.15 |
| silage | | 24.06 | | | |
| clover hay | | 4.53 | | | |
| Feed per pound gain | | | | | |
| shelled corn | 3.217 | 6.249 | 4.1747 | 2.2417 | 2.839 |
| linseed oil meal | .4023 | .7812 | .52184 | .2802 | .3584 |
| silage | | 11.9657 | | | |
| clover hay | | 2.254 | | | |
| Total cost of feeds and pasture | \$57.68 | \$86.216 | \$70.789 | \$57.68 | \$67.793 |
| Cost of gains per cwt. | \$ 4.3696 | \$9.527 | \$ 5.424 | \$ 3.043 | \$ 3.874 |
| Necessary selling price | \$ 4.765 | \$6.136 | \$ 5.288 | \$ 4.099 | \$ 4.549 |
| Final value per cwt. in lots without shrink | \$ 6.38 | \$6.694 | \$ 6.433 | \$ 6.362 | \$ 6.052 |
| Profit per lot | \$84.055 | \$31.934 | \$67.054 | \$118.355 | \$97.352 |
| Profit per steer | \$16.81 | \$ 6.386 | \$13.41 | \$ 23.67 | \$16.225 |

Table 7 gives a summary of the full feeding experiment. It will be noted that the rate of gain during the wintering experiment. A study of table 3 in connection with table 7 gives us the following comparison of gains which is given in the order of the summer gains.

| Lot No. | 4 | 5 | 1 | 2 | 3 |
|-------------------------------|-----|-------------------|-----|-----|-----|
| Total winter gains per steer. | -16 | 97 $\frac{1}{2}$ | 131 | 199 | 275 |
| Total summer gains per steer. | 379 | 291 $\frac{2}{3}$ | 264 | 261 | 181 |
| Total gains | 363 | 389 $\frac{1}{6}$ | 395 | 460 | 456 |

The foregoing data are certainly sufficient to demonstrate that there is a correlation between the feed a steer received during the winter months and its capacity to make rapid gains the following summer. They are somewhat contrary to the average stockman's belief that, in order to make the most economical use of grass, steers should receive some grain during the latter part of the winter so that they will be gaining in weight when turned on grass. As would be expected the total gains correspond in a general way to the winter gains, the only exception to this order being lot No. 2 which was finished in dry lot and for that reason not exactly comparable to the others. A further study of table 7 shows that the initial cost of cattle, the cost of gains and the necessary selling price vary inversely to the rate of gains. It also shows that, with one exception, the profit per steer varied with the rate of gain. These results indicate, that, so far as summer feeding on grass

is concerned, it will pay best to buy steers that have been wintered rather lightly.

Table 8 is presented as a summary in which the winter and summer feeding are considered together. The initial values and weights are the same as those at the beginning of the wintering experiment. The final weights and values correspond to those at the close of the summer feeding trial. A study of the results as presented in this table shows that the lots which were wintered lightly returned the largest profit on the combined winter and summer feeding operations. These results indicate that under existing market conditions the important consideration in wintering yearling steers intended for summer feeding on grass is cheapness of maintenance compatible with health, regardless of winter gains.

Table 8. - SUMMARY OF WINTER AND SUMMER TRIALS WITH STEERS
STARTED AS YEARLINGS.

Nov. 28, 1908 - July 26, 1909 - 240 Days.

| Lot No. | 1 | 2 | 3 | 4 | 5 |
|--|----------|----------|----------|----------|---------------------|
| Number of steers | 5 | 5 | 5 | 5 | 6 |
| Initial value per cwt. | \$4.25 | \$4.25 | \$4.25 | \$4.25 | \$4.25 |
| Average initial weight | 646# | 689# | 712# | 683# | 690 $\frac{5}{6}$ # |
| Average final weights | 1041# | 1145# | 1172# | 1046# | 1080# |
| Total gain per steer | 395# | 456# | 460# | 363# | 389 $\frac{1}{6}$ # |
| Average daily gain | 1.646# | 1.9# | 1.917# | 1.5125# | 1.622# |
| Total feed consumed | | | | | |
| shelled corn | 4248 | 10156 | 9948 | 4248 | 4968 |
| linseed oil meal | 531 | 707 | 681 | 531 | 621 |
| silage | 16875 | 27435 | | 16875 | |
| clover hay | 7389 | 8688 | 12061 | | 1415 |
| straw | | | | 3516 | |
| Total cost of feeds and pasture | \$112.55 | \$177.89 | \$159.21 | \$88.26 | \$103.45 |
| Total cost of feed and cattle | \$249.82 | \$324.30 | \$310.51 | \$233.40 | \$279.61 |
| Cost of gains per cwt. | \$5.699 | \$7.802 | \$6.922 | \$4.863 | \$4.430 |
| ↳ Necessary selling price | \$4.80 | \$5.665 | \$5.299 | \$4.462 | \$4.315 |
| ↳ Chicago weights | 4950 | 5500 | 5610 | 4960 | 6070 |
| Actual selling price | \$7.00 | \$7.25 | \$7.00 | \$7.00 | \$6.75 |
| ↳ Net value in lot per cwt. | \$6.38 | \$6.694 | \$6.435 | \$6.362 | \$6.052 |
| Profit per lot | \$82.28 | \$58.95 | \$66.47 | \$99.38 | \$112.57 |
| Profit per steer | \$16.456 | \$11.79 | \$13.294 | \$19.876 | \$18.761 |
| Profit per dollar invested in cattle and feeds. | .3293 | .18177 | .2146 | .4258 | .4026 |

THREE YEAR OLDS.

The three year old steers used in this experiment were the same steers that are recorded as two year olds in the report of the wintering experiment. The steers were not re-divided and the lot numbers 6, 7, 8 and 9 each refer to the same cattle in the wintering experiment that they do in this one.

At the close of the wintering experiment, lots Nos. 6, 8 and 9 were each turned on separate blue-grass pastures and full fed a grain ration of 8 parts by weight of shelled corn and 1 part by weight of linseed oil meal. Lot No. 7 was considered too fat to finish economically on grass and was continued in dry lot. As soon as each lot became thoroly accustomed to its grain ration they were given all they would clean up on one-half to three-quarters of an hour. The grain was fed in the morning only and under as nearly the same conditions as possible in all lots. Except for the individuality of the steers, the only varying factor of importance entering into this experiment with the grass fed cattle was the residual effect of the winter rations.

Table 9. - AVERAGE DAILY CONSUMPTION BY 30 DAY PERIODS.
THREE YEAR OLDS.

| Lot No. | Feeds | Periods | | |
|---------|------------------|---------|-------|--------|
| | | 1 | 2 | 3 |
| 6 | Shelled corn | 6.506 | 9.28 | 13.706 |
| | Linseed oil meal | .813 | 1.16 | 1.713 |
| 7 | Shelled corn | 10.826 | 12.48 | 16.966 |
| | Linseed oil meal | 1.353 | 1.56 | 2.113 |
| | Silage | 26.00 | 26.00 | 26.00 |
| | Clover hay | 8.573 | 8.24 | 6.04 |
| 8 | Shelled corn | 10.826 | 12.48 | 16.966 |
| | Linseed oil meal | 1.353 | 1.56 | 2.113 |
| 9 | Shelled corn | 6.506 | 9.28 | 13.706 |
| | Linseed oil meal | .813 | 1.16 | 1.713 |

Table 9 shows the average daily consumption by 30 day periods. So far as we are able to determine from this table, the only factor influencing the consumption of grain was the previous treatment of the steers in this respect. Steers which had received corn during the winter experiment were accustomed to eating corn when put on this experiment and got on full feed much faster than the others. It will be noticed that there was a steady increase in the amount of grain consumed, in all lots.

Table 10 is a summary of the results secured in the summer feeding trial. It will be observed that the rate of gains is in exactly the reverse order to the rate of gains during the winter. The average daily gains are as follows: Lot No. 9,

Table 10. - SHOWING RESIDUAL EFFECT OF WINTERING RATION.

| | 6 | | | |
|--|----------|----------|----------|----------|
| Lot No. | 6 | 7 | 8 | 9 |
| Number of Steers | 5 | 5 | 5 | 5 |
| Initial value per cwt. | \$6.00 | \$6.50 | \$6.35 | \$5.60 |
| Average initial weight | 1246 | 1273 | 1281 | 1064 |
| Average final weight | 1479 | 1468 | 1499 | 1376 |
| Total gain per steer | 233 | 195 | 218 | 312 |
| Average daily gain | 2.59 | 2.17 | 2.42 | 3.47 |
| Total feed consumed | | | | |
| shelled corn | 4424 | 6032 | 6032 | 4424 |
| linseed oil meal | 553 | 754 | 754 | 553 |
| silage | | 11700 | | |
| clover hay | | 3428 | | |
| Average daily ration | | | | |
| shelled corn | 9.83 | 13.40 | 13.40 | 9.83 |
| linseed oil meal | 1.23 | 1.68 | 1.68 | 1.23 |
| silage | | 26.00 | | |
| clover hay | | 7.62 | | |
| Feed per pound gain | | | | |
| shelled corn | 3.80 | 6.187 | 5.534 | 2.848 |
| linseed oil meal | .475 | .77333 | .692 | .354 |
| silage | | 12.00 | | |
| clover hay | | 3.52 | | |
| Total cost of feeds and pasture | \$63.35 | \$97.18 | \$80.92 | \$63.35 |
| Cost of gains per cwt. | \$ 5.437 | \$ 9.967 | \$ 7.423 | \$ 4.072 |
| Necessary selling price | \$ 5.489 | \$ 6.526 | \$ 6.078 | \$ 4.867 |
| Final value per cwt. in lots without shrink | \$ 6.139 | \$6.739 | \$ 6.454 | \$ 6.359 |
| Profit per lot | \$48.00 | \$15.56 | \$28.13 | \$102.65 |
| Profit per steer. | \$ 9.60 | \$ 3.112 | \$ 5.626 | \$20.53 |

3.47#; lot No. 6, 2.59#; Lot No. 8, 2.42# and lot No. 7, 2.17#.

A comparison of the total gains per steer during the winter and summer is taken from tables V and X.

| Lot No. | 9 | 6 | 8 | 7 |
|------------------------|-------------|-------------|-------------|-------------|
| Winter gains per steer | -21# | 123# | 156# | 217# |
| Summer gains per steer | <u>312#</u> | <u>233#</u> | <u>218#</u> | <u>195#</u> |
| Total gain per steer | 291# | 356# | 374# | 412# |

The results show conclusively that, from the standpoint of rapidity of gains on grass, cattle that have received rather meager rations during the winter are much more efficient than cattle that have received growing or fattening rations. It will be noticed that the initial value and the necessary selling price varied inversely as the rate of gain, while the total profit and profit per steer varied directly as the rate of gain, indicating that, under prevailing market conditions, it pays better to buy thin steers than fleshy ones for full feeding on grass.

Table 11 is presented in order to give a summary of the combined winter and summer feeding experiments with cattle finished as three year olds. The initial values and weights correspond to the initial values and weights at the beginning of the wintering experiment. The final values and weights correspond to those at the close of the summer experiment. The total feeds consumed are the totals of the feeds consumed during both winter and summer feeding trials. A study of the table shows that with

Table 11. - SUMMARY OF WINTER AND SUMMER TRIALS WITH STEERS
FINISHED THREE YEAR OLDS.

| Lot No. | 6 | 7 | 8 | 9 |
|--|----------|----------|----------|----------|
| Number of steers per lot | 5 | 5 | 5 | 5 |
| Initial value per cwt. | \$5.00 | \$5.00 | \$5.00 | \$5.00 |
| Average initial weight | 1123 | 1056 | 1125 | 1085 |
| Average final weight | 1479 | 1468 | 1499 | 1376 |
| Total gain per steer | 356 | 412 | 374 | 291 |
| Average daily gain | 1.483 | 1.716 | 1.558 | 1.212 |
| Total feed consumed | | | | |
| shelled corn | 4424 | 10532 | 10532 | 4444 |
| linseed oil meal | 553 | 754 | 754 | 553 |
| silage | 17760 | 29460 | | 17760 |
| clover hay | 12699 | 12940 | 15163 | |
| wheat straw | | | | 6512 |
| Total cost of feeds and pasture | \$140.79 | \$202.05 | \$181.75 | \$99.94 |
| Total cost of feeds and cattle | \$421.54 | \$466.05 | \$463.00 | \$371.19 |
| Cost of gains per cwt. | \$ 7.909 | \$ 9.808 | \$ 9.719 | \$ 6.868 |
| Necessary selling price | \$ 5.700 | \$ 6.349 | \$ 6.177 | \$5.395 |
| Chicago weights | 7000 | 7080 | 7180 | 6500 |
| Actual selling price in Chicago | \$6.75 | \$7.25 | \$7.00 | \$7.00 |
| Net value per cwt. in lots | \$6.139 | \$6.738 | \$6.454 | \$6.359 |
| Profit per lot | \$32.46 | \$28.59 | \$20.74 | \$66.31 |
| Profit per steer | \$ 6.492 | \$ 5.718 | \$ 4.148 | \$13.262 |
| Profit per dollar invested in cattle and feeds | \$.077 | \$.0613 | \$.0448 | \$.1786 |

one exception the total profit per lot varies with the rate of gain per lot. The necessary selling price varied directly with the cost of wintering and determined the relative profits per lot. These results indicate that, under existing market conditions, two year old cattle intended for full feeding on grass the following summer should be wintered as cheaply as possible, consistent with general health and vigor.

FINANCIAL STATEMENTS OF SUMMER FEEDING.

Lot 1. Five Two-Year Old Steers Full-fed on Pasture.

| | |
|---|------------------|
| To 5 steers, wt. 3885 @ \$4.90..... | \$190.365 |
| To 4248 lbs. shelled corn, @ .50¢ per bu..... | \$ 37.93 |
| To 531 lbs. linseed oil meal, @ \$32.00 ton.... | \$ 8.50 |
| To 90 days pasture, @ 75¢ per mo. per head.... | \$ 11.25 |
| To freight, @ 20¢ per cwt..... | \$ 9.90 |
| To yardage, hay, and commission..... | <u>\$ 4.50</u> |
| Total expenditures.. | \$262.445 |

| | |
|--|-----------------|
| By 5 steers, wt. 4950 @ \$7.00..... | <u>\$346.50</u> |
| Total profit..... | \$ 84.055 |
| Profit per steer..... | \$ 16.811 |
| Profit per dollar invested..... | \$.339 |
| Price received per bu. of shelled corn fed.... | \$ 1.608 |

Lot 2. Five Two-Year Old Steers Full-fed in Dry Lot.

| | |
|--|------------------|
| To 5 steers, wt. 4820 @ \$5.50..... | \$265.10 |
| To 5656 lbs. shelled corn, @ 50¢ bu..... | \$ 50.50 |
| To 707 lbs. linseed oil meal @ \$32.00 ton.... | \$ 11.312 |
| To 10829 lbs. silage @ \$3.00 ton..... | \$ 16.244 |
| To 2040 lbs. clover hay @ \$8.00 ton..... | \$ 8.16 |
| To freight, @ 20¢ per cwt..... | \$ 11.00 |
| To yardage, hay and commission..... | <u>\$ 4.50</u> |
| Total expenditures | \$366.816 |

| | |
|--|-----------|
| By 5 steers, wt. 5500 @ \$7.25..... | \$398.75 |
| Total profit..... | \$ 31.934 |
| Profit per steer..... | \$ 6.386 |
| Profit per dollar invested..... | \$.0909 |
| Price received per bu. of shelled corn fed.... | \$.816 |

Lot 3. Five Two-Year Old Steers Full-fed on Pasture.

| | |
|--|----------------|
| To 5 steers, wt. 4555 @ \$5.25..... | \$239.138 |
| To 5448 lbs. shelled corn @ 50¢ bu..... | \$ 48.643 |
| To 681 lbs. linseed oil meal @ \$32.00 ton.... | \$ 10.896 |
| To pasture, @ 75¢ per head per month..... | \$ 11.25 |
| To freight, @ 20¢ per cwt..... | \$ 11.23 |
| To yardage, hay and commission..... | <u>\$ 4.50</u> |
| Total expenditure | \$325.647 |

| | |
|--|-----------------|
| By 5 steers, wt. 5610 @ \$7.00 cwt..... | <u>\$392.70</u> |
| Total pfofit..... | \$ 67.053 |
| Profit per steer..... | \$ 13.41 |
| Profit per dollar invested..... | \$.2163 |
| Price received per bu. of shelled corn fed.... | \$ 1.173 |

Lot 4. Five Two-Year Old Steers Full-fed on Pasture.

| | |
|--|----------------|
| To 5 steers, wt. 3335 @ \$4.70..... | \$156.745 |
| To 4248 lbs. shelled corn @ 50¢ bu..... | \$ 37.93 |
| To 531 lbs. linseed oil meal, @ \$32.00 ton... | \$ 8.50 |
| To pasture @ 75¢ per head per month..... | \$ 11.25 |
| To freight, @ 20¢ per cwt..... | \$ 9.92 |
| To yardage, hay and commission..... | <u>\$ 4.50</u> |
| Total expenditures | \$228.845 |

| | |
|---|-----------------|
| By 5 steers, wt. 4960 @ \$7.00..... | <u>\$347.20</u> |
| Total profit..... | \$118.355 |
| Profit per steer..... | \$ 23.671 |
| Profit per dollar invested..... | \$.5519 |
| Price received per bu. of shelled corn fed... | \$ 2.0602 |

Lot 5. Six Two-Year Old Steers, Full-fed on Pasture.

| | |
|--|----------------|
| To 6 steers, wt. 4730 @ \$4.80..... | \$227.04 |
| To 4968 lbs. shelled corn, @ 50¢ bu..... | \$ 44.357 |
| To 631 lbs. linseed oil meal, @ \$32.00 ton... | \$ 9.936 |
| To pasture @ 75¢ per head per month..... | \$ 13.50 |
| To freight, @ 20¢ per cwt..... | \$ 12.14 |
| To yardage, hay and commission..... | <u>\$ 5.40</u> |
| Total expenditures.. | \$312.373 |

| | |
|---|------------------|
| By 6 steers, wt. 6070 @ \$6.75..... | <u>\$409.725</u> |
| Total profit..... | \$ 97.352 |
| Profit per steer..... | \$ 16.225 |
| Profit per dollar invested..... | \$.3302 |
| Price received per bu. of shelled corn fed... | \$ 1.597 |

Lot 6. Five Three-Year Old Steers, Full-fed on Pasture.

| | |
|--|----------------|
| To 5 steers, wt. 6230 @ \$5.50 per cwt..... | \$342.65 |
| To 4424 lbs. shelled corn, @ 50¢ per bu..... | \$ 39.50 |
| To 553 lbs. linseed oil meal @ \$32.00 per ton | \$ 8.85 |
| To pasture @ \$1.00 per month per head..... | \$ 15.00 |
| To freight @ 20¢ per cwt..... | \$ 14.00 |
| To yardage, hay and commission..... | <u>\$ 4.50</u> |
| Total expenditures.. | \$424.50 |

| | |
|---|-----------------|
| By 5 steers, wt. 7000 lbs. @ \$6.75..... | <u>\$472.50</u> |
| Total profit..... | \$ 48.00 |
| Profit per steer..... | \$ 9.60 |
| Profit per dollar invested..... | \$.118 |
| Price received per bu. of shelled corn fed... | \$ 1.107 |

Lot 7. Five Three-Year Old Steers Full-fed in Dry Lot.

| | |
|--|----------------|
| To 5 steers, wt. 6365 @ \$6.00..... | \$381.90 |
| To 6032 lbs. shelled corn, @ 50¢ per bu..... | \$ 53.857 |
| To 754 lbs. linseed oil meal @ \$32.00 per ton | \$ 12.06 |
| To 11700 lbs. silage @ \$3.00 per ton..... | \$ 17.55 |
| To 3428 lbs. clover hay @ \$8.00 per ton..... | \$ 13.71 |
| To freight, @ 20¢ per cwt..... | \$ 14.16 |
| To yardage, hay and commission..... | <u>\$ 4.50</u> |
| Total expenditures. | \$497.737 |

| | |
|---|-----------------|
| By 5 steers, wt. 7080 @ \$7.25..... | <u>\$513.30</u> |
| Total profit..... | \$ 15.56 |
| Profit per steer..... | \$ 3.112 |
| Profit per dollar invested..... | \$.0324 |
| Price received per bu. of shelled corn fed... | \$.6444 |

Lot 8. Five Three-Year Old Steers, Full-fed on Pasture.

| | |
|--|----------------|
| To 5 steers, wt. 6405 @ \$5.85..... | \$374.6925 |
| To 6032 lbs. shelled corn @ 50¢ per bu..... | \$ 53.86 |
| To 754 lbs. linseed oil meal @ \$32.00 per ton | \$ 12.06 |
| To 90 days pasture @ \$1.00 per head per mo... | \$ 15.00 |
| To freight @ 20¢ per cwt..... | \$ 14.36 |
| To yardage, hay and commission..... | <u>\$ 4.50</u> |
| Total expenditures. | \$474.4725 |

| | |
|---|-------------------|
| By 5 steers, wt. 7180 @ \$7.00..... | <u>\$502.6000</u> |
| Total profit..... | \$ 38.1275 |
| Profit per steer..... | \$ 5.6255 |
| Profit per dollar invested..... | \$.0617 |
| Price received per bu. of shelled corn fed... | \$.7611 |

Lot 9. Five Three-Year Old Steers, Full-fed on Pasture.

| | |
|--|----------------|
| To 5 steers, wt. 5320 @ \$5.10 per cwt..... | \$271.32 |
| To 4444 lbs. shelled corn @ 50¢ per bu..... | \$ 39.68 |
| To 553 lbs. linseed oil meal @ \$32.00 per ton | \$ 8.85 |
| To 90 days pasture, @ \$1.00 per mo. per head. | \$ 15.00 |
| To freight, @ 20¢ per cwt..... | \$ 13.00 |
| To yardage, hay and commission..... | <u>\$ 4.50</u> |
| Total expenditures | \$352.35 |

| | |
|---|-----------------|
| By 5 steers, wt. 5500 @ \$7.00 per cwt..... | <u>\$455.00</u> |
| Total profit..... | \$102.65 |
| Profit per steer..... | \$ 20.53 |
| Profit per dollar invested..... | \$.3065 |
| Price received per bu. pf shelled corn fed... | \$ 1.7934 |

PART 3

INFLUENCE OF AGE ON THE RATE AND COST OF GAINS.

The data presented in this discussion was compiled from the records of summer feeding experiments reported in Part 2 of this thesis. It should be noted at the outset that there was one factor besides the age of the cattle which may have influenced the results of this experiment, viz. the relative condition of the two and three year olds at the beginning of the experiment. A study of the results of the wintering experiment shows a large variation in the condition of the steers of each age, but taken altogether, the three year olds were much fleshier than the two year olds at the beginning of the experiment from which this data was secured. Therefore, the results of this experiment should not be construed as applying to the influence of age in general, but only to those phases of the subject where conditions already noted exist.

Table 12 summarizes the experimental results by ages. The lots of 5 steers each, fed in dry lot, are lots No. 2 and No. 7, two and three year olds respectively. They received comparable rations during this experiment and also during the preceeding winter. The two lots of 15 steers each, fed on blue grass pasture, are, in the case of the two year olds, lots Nos. 1, 3 and 4; in the case of the three year olds, Lots Nos. 6, 8 and 9 combined, thus giving 15 steers of each age which were fed alike during the summer and received rations comparable by ages during the preceeding winter.

Table 12. - INFLUENCE OF AGE ON RAPIDITY AND COST OF GAINS.

| No. of steers per lot | Dry fed lots | | Lots fed on pasture | |
|---|--------------|-------------|---------------------|---------------|
| | Twos 5 | Threes 5 | Twos 15 | Threes. 15 |
| Average initial value per cwt. in lots. | \$5.50 | \$6.00 | \$4.9277 | \$5.506 |
| Average initial weight | 964 | 1273 | 785 | 1197 |
| Average final weight | 1145 | 1468 | 1086 $\frac{1}{3}$ | 1451.46 |
| Total gain per steer | 181 | 195 | 301 $\frac{1}{3}$ | 254.46 |
| Average daily gain per steer | 3.01 | 3.17 | 3.348 | 2.827 |
| Total feed consumed | | | | |
| shelled corn | 5656 | 6032 | 13944 | 14900 |
| linseed oil meal | 707 | 754 | 1743 | 1860 |
| silage | 10829 | 11700 | | |
| clover hay | 2040n | 3428 | | |
| Feed per pound of gain | | | | |
| shelled corn | 6.249 | 6.187 | 3.0848 | 3.904 |
| linseed oil meal | .7812 | .77333 | n.38561+ | .487 |
| silage | 11.9657 | 12.000 | | |
| clover hay | 2.254 | 3.520 | | |
| Total cost of feed and cattle | \$351.316 | \$479.08 | \$766.39 | \$1196.46 |
| Cost of gains per cwt. | \$ 9.527 | \$ 9.967 | \$ 4.118 | \$ 5.444 |
| Necessary selling price in lots | \$ 6.134 | \$ 6.526 | \$ 4.703 | \$ 5.495 |
| Chicago weight | 5500 | 7080 | 15520 | 20680 |
| Average Chicago price per cwt. | \$7.25 | \$ 7.25 | \$ 7.00 | \$ 6.915 |
| Net value in lots per cwt. | \$6.694 | \$ 6.738 | \$ 6.394 | \$ 6.3165 |
| Profit per lot | \$31.934 | \$ 15.56 | \$275.47 | \$178.78 |
| Profit per steer. | \$ 6.386 | \$ 3.112 | \$ 18.365 | \$ 11.919 |
| Profit per dollar invested in cattle and feed | \$.0909 | \$.0324 | \$.3594 | \$.1494 |
| Price received per bu. of corn fed | \$.816 | \$.6444 | \$ 1.606 | \$ 1.172 |

A study of the table shows that where the cattle were finished in dry lot the rate of gain was larger in the case of the three year olds; but where the cattle were finished on pasture, the two year olds made much more rapid gains than the three year olds. This was not what was expected as there is considerable available data to show that, in fattening calves, yearling and twos at least, the older the animal, other things being equal, the more rapid is the gain in weight and marketable finish. However, the results obtained in this experiment may be explained by the high condition of the three year olds at the beginning.

A comparison of the total amounts of feed consumed by the various lots shows that the capacity of the three year olds was not as great in proportion to their weight as the capacity of the two year olds except in respect to the clover hay consumed by steers in dry lot. The table further shows that the cheapest gains both in dry lot and on pasture were made by the younger cattle. This is in accord with the majority of experimental data on the subject.

At the time these cattle were sold, light, handy weight cattle were commanding a premium on the market and this should be taken into consideration in studying the relative profits yielded by two and three year olds.

NOTE

The experiments reported in this thesis were conducted at the Missouri Experiment Station by the writer, under the supervision of Prof. F. B. Mumford. The original data may be found in the "Beef Cattle Experimental Books" for winter 1908-9 and summer 1909.



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