UNIVERSITY OF MISSOURI COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION
RESEARCH BULLETIN 51

The Influence of the Plane of Nutrition On the Maintenance Requirement of Cattle

(Publication Authorized November 21, 1921.)

COLUMBIA, MISSOURI
FEBRUARY, 1922

UNIVERSITY OF MISSOURI

COLLEGE OF AGRICULTURE

Agricultural Experiment Station

TABLE OF CONTENTS

The Influence of the Plane of Nutrition On the Maintenance Requirement of Cattle

A. G. HOGAN, W. D. SALMON, H. D. FOX

In 1914 an investigation* was begun at the Missouri Agricultural Experiment Station to study effects of underfeeding. Calves of beef breeding were secured, divided into three groups, and each group was placed on a different plane of nutrition. Group I was fed to grow rapidly, but not to become fat. Group II was placed on a lower nutritional plane, and was fed to gain about one-half pound per day. Group III was placed on a still lower plane and was fed to gain about one-third of a pound per day.

There were large differences in the food intake of the three groups, and after a considerable amount of data had been obtained it was decided to make a study of the maintenance requirement of these steers.

REVIEW OF LITERATURE

There has accumulated a considerable mass of literature concerning the maintenance requirement, in terms of energy, of animals as well as of man. Much of this material has no direct bearing on the problem discussed in this paper, but a short historical statement may be useful.

Waters[1] pointed out in 1908 that if the ration of an animal were suddenly reduced to a point a little less than sufficient to maintain its weight, there would be a process of readjustment. After a time a stationary live weight would be obtained if the reduction were not too severe, and following that there might be an increase in weight.

More recent data from the Missouri Experiment Station[2] show a lower maintenance requirement for animals on a low plane of

*This investigation was initiated by F. B. Mumford, Dean of the College of Agriculture, and P. F. Trowbridge, formerly chairman of the department of agricultural chemistry. Since September, 1918, E. A. Trowbridge, chairman of the department of animal husbandry, has had general supervision of the project. This article was prepared by A. G. Hogan, who has been in immediate charge since September, 1920. Mr. Salmon supervised the preliminary calculations, and calculated the data for the summer periods. Mr. Fox made the calculations for the winter periods. A large number of workers have contributed to the success of the investigation, but it does not seem practicable to mention them all individually. A short article embodying the essential points of the investigation was published in the Journal of Agricultural Research, Vol. XXII, p. 115.

[1]Refers to Bibliography, page 21.

nutrition. Three steers were full-fed until eleven months old, then subjected to a maintenance trial. In order of economy in maintenance requirement they ranked as follows: Steer 598 first, Steer 596 second, Steer 590 third. Following this No. 596 was full-fed, No. 598 was given one-half productive feed, and No. 590 one-fourth productive feed. The steers were again subjected to a maintenance trial in which they ranked as follows, No. 590 first, No. 598 second, No. 596 third. Evidently the maintenance requirement closely paralleled the plane of nutrition.

Armsby[3a] cites the observations of Zuntz and Hagemann showing that a surplus of feed stimulated muscular activity and restlessness of the horse to such an extent that a ration more than sufficient for maintenance of this animal when standing quietly in its stall, would not cause an increase in weight under ordinary conditions. Experiments with cattle[4] indicate a similar stimulating effect upon their muscular movements. Armsby, therefore, concludes that at least a part of the lower maintenance cost may come from "voluntary restriction of motion on the part of the animals on a low nutritive plane."

An experiment by Armsby and Fries[5] showed that the maintenance requirement of a two-year-old steer was increased 36 percent by a three-month fattening period in which the live weight was increased by about 300 pounds. The computed basal metabolism per 1000 pounds live weight per day showed the following variations in maintenance requirement:

	In proportion to weight	In proportion to 2-3 power of live weight
Unfattened	4,919 cal.	5,125 cal.
Fattened	5,275 cal.	5,943 cal.

"The basal katabolism increased faster than the body weight or the body surface as estimated by the Meeh formula. Apparently the accumulation of fat tended in some way to stimulate the general metabolism." Both Kellner and Evvard have reported data, cited by Armsby[3b] showing that fat steers have a higher maintenance requirement than those in medium condition.

The extensive researches of F. G. Benedict and co-workers[6] in the field of human physiology are of especial significance. They have demonstrated that the basal metabolism of their subjects was markedly lower on a restricted diet than on a normal diet. In other words the maintenance requirement was lowered. In most

cases we have mentioned it is impossible to decide to what extent decreased muscular activity accounts for the lower maintenance requirement when animals are on a low nutritive plane.

EXPERIMENTAL

The conditions of this investigation are unique in one respect, the animals were started on the project at weights varying from 154 to 238 pounds and thereafter were kept constantly on the same plane of nutrition. Since the animals were under observation for from four to seven years, any marked or permanent adjustment to nutritional conditions should become apparent.

The ideal method of conducting an investigation of the maintenance requirement of cattle would provide for a respiration calorimeter. Since that was impossible the alternative was to calculate the energy value of the food consumed, and correct this for the estimated value of the gains (or losses) in body weight. The net energy of the feed consumed was calculated in accordance with procedures developed by Armsby. The energy values of the changes in body weight were calculated from the composition of steers that had been analyzed by the department of agricultural chemistry at this station.

Experimental Animals.—Three of the steers now under observation were started on the investigation in 1914, and seven others were added in 1917. Some of the more significant early records are condensed in the following table.

TABLE 1.—GROUPS, DATES OF BIRTH, AND BREEDS OF ANIMALS.

Animal	Group	Date of birth	Date put on Exp.	Weight when put on Exp.	Breed
528	I	May 8, 1914	June 11, 1914	157	Hereford-high-grade
577	I	March, 1914	Aug. 5, 1917	227	Shorthorn-grade
571	I	March, 1917	Aug. 5, 1917	158	Hereford-grade
579	II	May 2, 1914	May 30, 1914	154	Shorthorn-grade
573	II	April, 1917	Aug. 5, 1917	203	Hereford-grade
578	II	April, 1917	Aug. 5, 1917	238	Hereford-grade
585	III	April 26, 1914	May 22, 1914	123	Hereford-high-grade
572	III	April, 1917	Aug. 5, 1917	196	Hereford-grade
574	III	April, 1917	Aug. 5, 1917	237	Hereford-grade
575	III	April, 1917	Aug. 5, 1917	204	Hereford-grade

Quarters.—The steers had access to a shed open to the south. Adjoining this shed were dry lots sloping to the south, and having shade protection.

Rations.—The concentrate consisted of the following mixture: Corn chop, 60 percent; wheat bran, 30 percent; linseed meal, 10 percent. The roughage fed from the beginning of the experiment until July 20, 1917, was timothy. For the next ten days a mixture of 5 parts timothy, 3 parts alfalfa and 2 parts oat straw was fed. Following this the roughage consisted of a mixture of 60 percent alfalfa and 40 percent oat straw. The animals were fed twice daily and had access to water at all times. Salt was accessible at feeding time.

Weights.—The steers were weighed each morning, after feeding, but before watering. The weight given for the beginning of a period is the average of the ten preceding days. The weight given at the end is an average of the last ten days of the period.

Periods.—The calculations are made for periods of 180 days, with the exception of the first period for each of the three older steers, which were as follows: No. 528, 130 days; No. 579, 142 days; No. 585, 150 days. In order that one period each year might be free from the disturbing effects of cold weather, the year was divided into a "summer" and "winter" period. The summer periods began in April or May, and ended in October. The winter periods began in October or November and ended in April or May.

Energy Intake.—Our calculations of the energy values of the feed consumed are based on two methods described by Armsby[4]. In one case the dry matter, in the other the digestible organic nutrients consumed, was used to calculate the net energy intake of the steers.

The method of calculation based on dry matter consumed is as follows. For the concentrates the value 83.82 therms per 100 pounds dry matter was used. This is the factor given for Armsby's grain mixture No. 2*, which approximates the grain mixture used in this experiment. For timothy hay the value 48.63 therms per 100 pounds dry matter was used. The factor for the roughage mixture used in the latter part of the experiment was calculated from the Armsby values, for alfalfa 34.10 therms, and for oat straw

*Armsby's grain mixture No. 2—60 percent corn meal; 30 percent crushed oats; 10 percent O. P. linseed meal.

Our grain mixture—60 percent corn meal; 30 percent wheat bran; 10 percent O. P. linseed meal.

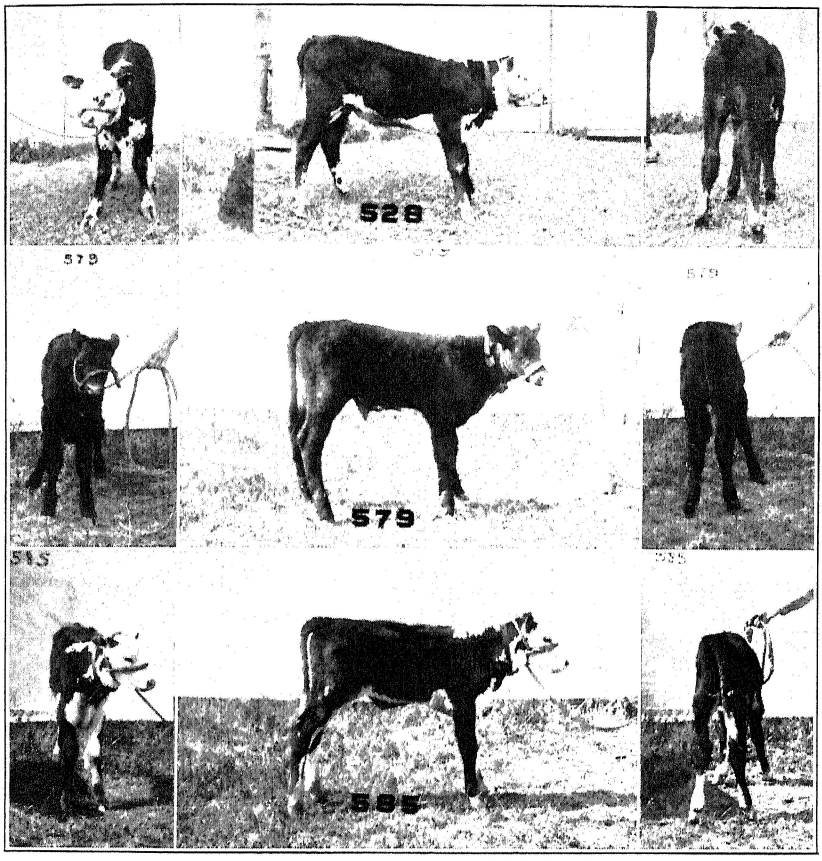

Plate I.—Taken at the beginning of the investigation.

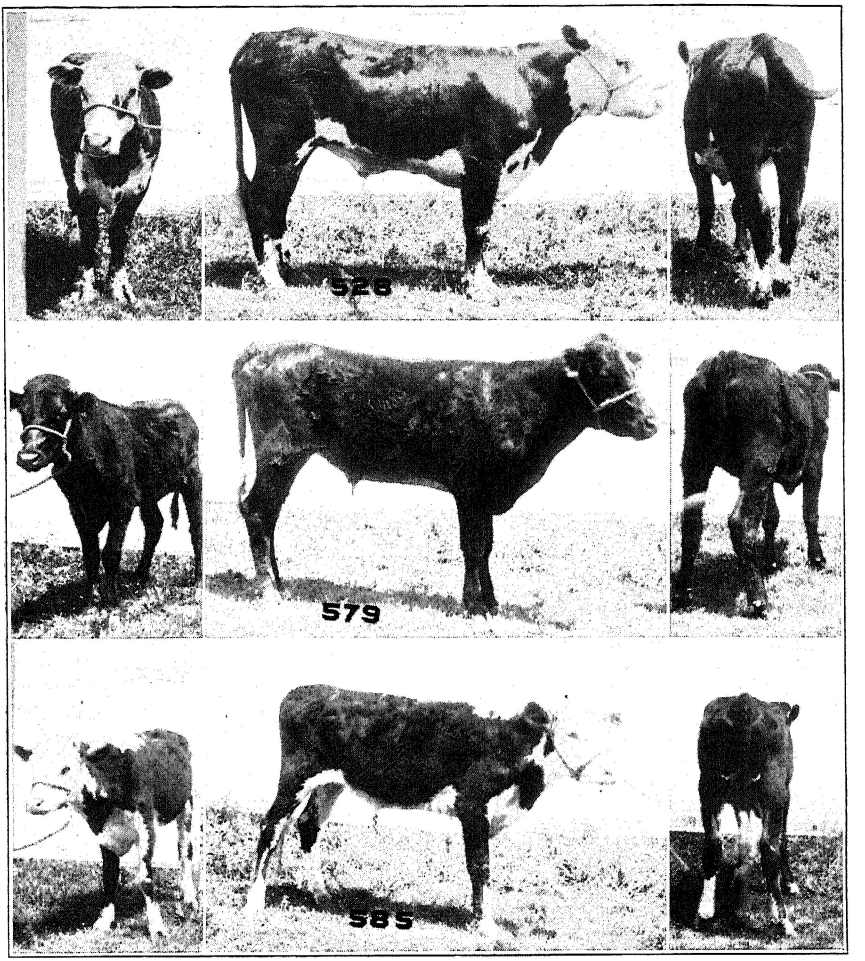

Plate II.—Taken after being fed three years on their respective nutritional planes.

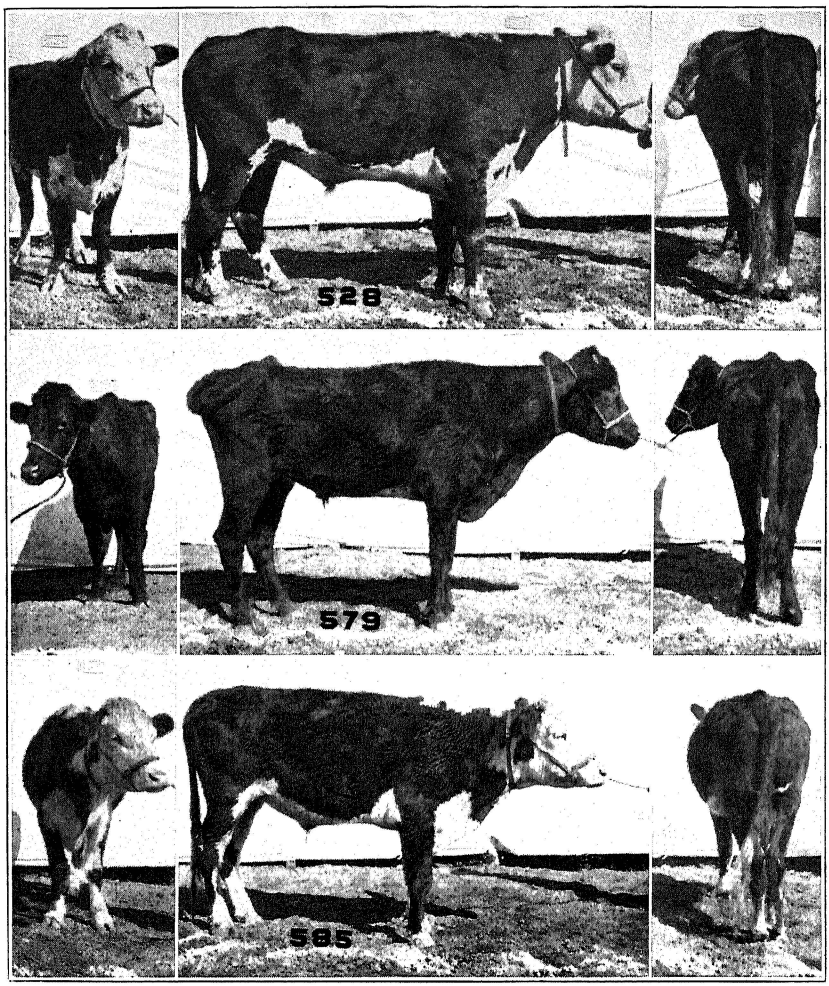

Plate III.—Taken after being fed six years on their respective nutritional planes.

26.03 therms per 100 pounds dry matter. A mixture of 60 parts alfalfa and 40 parts oat straw would have a value of 30.87 therms per 100 pounds dry matter.

The values used are summarized below in tabular form.

TABLE 2.—ENERGY VALUES PER 100 POUNDS DRY MATTER.

	Net energy values in therms
Alfalfa hay	34.10
Oat straw	26.00
Mixture, 60 percent alfalfa, 40 percent oat straw	30.87
Timothy hay	48.63
Grain	83.82

The calculations of the energy value of the milk are also based on factors published by Armsby[3c]. These are 29.01 therms per 100 pounds whole milk (4.4 percent) and 14.31 therms per 100 pounds skim milk (0.2 percent). From these values factors were computed for the different grades of milk used. The values used are given in Table 3.

TABLE 3.—NET ENERGY VALUE OF MILK USED.

Percent fat in milk	Therms net energy per hundred pounds
4.40 (whole milk)	29.010
3.20	24.776
2.70	23.130
1.85	20.086
1.20	17.838
0.20 (skim milk)	14.310

The net energy intake, based on digestible organic nutrients consumed, was calculated by the procedure outlined below.

The Armsby factor for the metabolizable energy of digestible organic matter from roughage is 1.588 therms per pound. For grains and similar feeds the factor is 1.769 therms per pound.

Armsby[3d] has also determined the "average energy expenditure" by cattle per 100 pounds of dry matter eaten. This is given in Table 4.

TABLE 4.—ENERGY EXPENDED BY CATTLE PER 100 LBS. DRY MATTER CONSUMED.

Roughage	Energy expenditure in therms
Timothy hay	35.47
Alfalfa hay	53.03
Oat straw	46.00
Concentrate	
Grain mixture No. 2	51.76

The coefficients of digestibility used in these calculations were derived from digestion trials conducted under similar conditions at this Station.[7] These indicated that the digestibility of the ration varied with the relative amounts of hay and grain fed. The factors used are given below.

TABLE 5.—DIGESTION FACTORS FOR ORGANIC MATTER.

Ratio of grain to hay	1:1	2:3	1:2	1:3, 4 or 5	1:6 or 7	1:8, 9 or 10	Hay only
Factor	.6956	.6695	.6434	.6340	.6229	.6030	.5832

Inasmuch as the thermal value of a pound of organic matter from grain differs from that of a similar weight of organic matter from roughage, the Armsby factors previously quoted in this paper could not be directly applied to the values obtained with the above digestion coefficients. Those factors would not provide for the widely varying proportions of grain and hay. The following method therefore was used in computing the energy intake on the basis of digestible organic matter consumed. By use of the factors in Table 5 the weight in pounds of digestible organic matter in the mixed ration was determined for each period. This was multiplied by 1.588, the Armsby factor for metabolizable energy in a pound of digestible organic matter from hay. The thermal value of digstible organic matter from grain is 1.769 however, or 0.181 therms more. Therefore each pound of digestible organic matter derived from grain was multiplied by 0.181, and the product added to the result obtained by multiplying the total digestible organic matter by 1.588. This gave the total metabolizable energy in both the hay and grain. The digestibility of the organic matter of the

grain was estimated by difference. This ranged closely around 80 percent. The factors for energy expenditure are given in Table 4.

It seemed impracticable to calculate the net energy of the milk consumed on the basis of digestible organic matter, so the calculation based on dry matter was used for milk. Since the amount was small, however, the method of calculation would have little effect on the final results.

Changes in Body Weight.—In order to obtain data concerning the maintenance requirement of these steers, it is necessary to calculate the energy gained or lost through changes in body weight. Our calculations are based on analyses previously made by the department of agricultural chemistry*, University of Missouri. Control animals were selected from those on which analyses were available, on the basis of similar weights and measurements, and when possible of similar ages, daily gains and daily consumption of dry matter. In some cases suitable check animals were not available, and the composition of steers for those periods was estimated by interpolation, using data of the preceding and succeeding periods. Using these assumed values for the composition of the steers during the different periods, the gain in protein and fat was readily calculated. The thermal equivalent of the protein and fat gained was calculated from data obtained by other investigators. Armsby[3e] quotes data, computed by Kohler, giving the value 5.6776 calories per gram or 2.5753 therms per pound, for protein of muscular tissue of cattle.

Fries[8] gives an average value of 9.4889 calories per gram of beef fat, or 4.3048 therms per pound.

Since no suitable control animal was available for the last two periods of Steer 528, the gains for these two periods in terms of protein and fat were not calculated, and the energy value of a pound gain was assumed to be 3,000 therms per pound. This is the value given by Armsby[3f] for animals of apparently similar condition.

The values we have used, also those published by Armsby are given in Table 6. Armsby's values are consistently higher, as is to be expected. Our animals were thin, and contained less than the usual amount of fat in the gain.

In calculating the maintenance requirements per 1,000 pounds live weight, Moulton's[9] formula was used. He has shown that

*These have not as yet been published.

TABLE 6.—ENERGY VALUE PER POUND GAIN.

Approximate age	Group			Armsby's Values	
	I	II	III	Age	Energy
months	therms	therms	therms	months	therms
6	.95575	.95575	.8343	1	1.170
18	1.0918	1.0583	.9445	2-3	1.374
36	1.7136	1.1608	1.0548	5-6	1.680
54	2.1993	1.4104	1.1013	11-12	2.292
66	2.50	1.5352	1.4790	18-24	3.000
78	3.00	1.660	1.6490		

the surface areas of thin cattle are proportional to the five-eighths power of the live weight.

The average maintenance requirement of the three groups is given in Tables 7 to 10 inclusive. The summer and winter periods are given separately, and each has been calculated by two methods. One is based on dry matter consumed, the other on digestible organic nutrients consumed.

In calculating the maintenance requirement on the basis of digestible organic matter consumed, digestion coefficients were used that had been obtained at this station under similar conditions. This method is probably more accurate than the one based on dry matter consumed, and in this case gives a result somewhat higher.

During the summer months there were four periods in all in which losses in live weight occurred. In calculating averages those periods were omitted, as the results are low. It is possible that

TABLE 7.—AVERAGE DAILY MAINTENANCE REQUIREMENT DURING SUMMER PERIODS AS CALCULATED FROM DRY MATTER CONSUMED.

Steer number	Therms net energy per 1000 pounds based on 5-8 power of live weight		
	Group I	Group II	Group III
528—Average of 6 periods	5.870	.....	.....
577—Average of 3 periods	5.280	.....	.....
571—Average of 3 periods	5.073	.....	.....
579—Average of 5 periods	.....	4.920	.....
578—Average of 3 periods	.....	3.830	.....
573—Average of 3 periods	.....	4.409	.....
585—Average of 5 periods	.....	.....	4.221
575—Average of 3 periods	.....	.....	4.041
574—Average of 3 periods	.....	.....	4.302
572—Average of 3 periods	.....	.....	3.256
Average of each group	5.523	4.483	3.921

TABLE 8.—AVERAGE DAILY MAINTENANCE REQUIREMENT DURING WINTER MONTHS AS CALCULATED FROM DRY MATTER CONSUMED.

Steer number	Therms net energy per 1000 pounds based on 5-8 power of live weight		
	Group I	Group II	Group III
528—Average of 6 periods	5.909	.....	.....
577—Average of 3 periods	5.530	.....	.....
571—Average of 3 periods	5.450	.....	.....
579—Average of 6 periods	.....	4.647	.....
578—Average of 3 periods	.....	3.730	.....
573—Average of 3 periods	.....	4.753	.....
585—Average of 6 periods	.....	.....	4.366
575—Average of 3 periods	.....	.....	4.260
574—Average of 3 periods	.....	.....	4.673
572—Average of 3 periods	.....	.....	3.157
Average of each group	5.770	4.444	4.164

they are correct, but the apparently diminished requirement may be due to an incorrect assumption as to the energy value of the loss in weight. One steer, No. 585, had a navel infection during the first summer period, accompanied by a very high maintenance requirement. This period also was discarded in calculating averages.

There is a close parallel between the intake of net energy and the maintenance requirement of the animal. The record of Steer 574 for the summer periods illustrates that tendency. For the first period the average daily intake of net energy was 3.884 therms per 1,000 pounds, based on the five-eighths power of the live weight, and the maintenance requirement was 3.818 therms. For the second period the energy intake was increased to 5.783 therms, and the

TABLE 9.—AVERAGE DAILY MAINTENANCE RRQUIREMENT DURING SUMMER MONTHS AS CALCULATED FROM DIGESTIBLE ORGANIC MATTER CONSUMED.

Steer number	Therms net energy per 1000 pounds based on 5-8 power of live weight		
	Group I	Group II	Group III
528—Average of 6 periods	6.261	.....	.....
577—Average of 3 periods	5.412	.....	.....
571—Average of 3 periods	5.174	.....	.....
579—Average of 5 periods	.....	5.260	.....
578—Average of 3 periods	.....	4.192	.....
573—Average of 3 periods	.....	4.893	.....
585—Average of 5 periods	.....	.....	4.725
575—Average of 3 periods	.....	.....	4.454
574—Average of 3 periods	.....	.....	4.591
572—Average of 3 periods	.....	.....	3.649
Average of each group	5.777	4.869	4.408

TABLE 10.—AVERAGE DAILY MAINTENANCE REQUIREMENT DURING WINTER MONTHS AS CALCULATED FROM DIGESTIBLE ORGANIC MATTER CONSUMED

Steer number	Therms net energy per 1000 pounds based on 5-8 power of live weight		
	Group I	Group II	Group III
528	5.965	.....	.....
577	5.713	.....	.....
571	5.553	.....	.....
579	.....	5.071	.....
578	.....	4.494	.....
573	.....	5.513	.....
585	.....	.....	4.625
575	.....	.....	4.429
574	.....	.....	5.290
572	.....	.....	3.754
Average of each group	5.799	5.037	4.869

maintenance requirement increased to 5.119 therms. In the third period the energy intake was 5.253 therms, and the maintenance requirement was 4.836 therms.

In comparing the maintenance requirements of the three groups it should be kept in mind that Group I does not represent a high plane of nutrition. The aim was to secure maximum growth with no considerable fattening. Their maintenance requirements as computed in this paper correspond closely to the average of 22 respiration experiments by Armsby and Fries, and seven by Kellner on cattle in medium condition. A comparison of our results (computed on the basis of digestible organic matter consumed) and of those obtained by other investigators is given in Table 11.

A few facts not shown by the data seem worthy of record. Although some of the steers were receiving a very scanty ration, they apparently did not have an unusual desire for food, and some care was necessary to prevent their "getting off feed." This is especially true of the roughage, for it was impossible to induce them to consume a large quantity of hay. Any increase in the grain ration had to be very gradual.

The dentition of these steers was apparently the same as for normal animals, as regards age. So far as could be determined by observation, the temporary teeth were lost at the normal age.

Influence of Age.—The ages represented in this experiment vary from 30 days for some of the calves at the beginning of the first summer period to more than six years at the close of the seventh period. Apparently there was no relation between the age

TABLE 11.—DAILY MAINTENANCE REQUIREMENTS OF CATTLE —NET ENERGY

No. of Experiments	Investigator	Condition of animal	Therms per 1000 lbs. live wt.		
			Maximum	Minimum	Average
	Respiration Exp's.				
22	Armsby and Fries (3b).....	Medium	7.430	4.723	5.995
7	Kellner (3b).....	Medium	6.780	4.921	5.742
	Kellner (3b).....	Fat	8.871	7.319	7.946
	Live Wt. Exp's.				
10	Armsby (3b).....	Thin	7.044	6.136	6.505
3	Armsby (3b).....	Thin	6.039	4.713	5.423
6	Haecker (3b).....	Medium	5.676	4.662	5.021
3	Evvard (3b).....	Medium	7.079	5.841	6.173
7	Eckles (3b).....	Medium	7.079	5.841	6.173
1	Shirky (7).....	Medium A	.....	.....	7.732
2	Shirky (7).....	Thin B	5.0959	4.953	5.0245
3	Our results, summer periods	Group I	7.380	4.915	5.777
3	Our results, summer periods	Group II	5.724	3.809	4.869
4	Our results, summer periods	Group III	5.217	3.276	4.408
3	Our results, winter periods.	Group I	7.431	4.314	5.799
3	Our results, winter periods.	Group II	7.598	3.246	5.037
4	Our results, winter periods.	Group III	5.574	3.475	4.869

A Corresponds to Group I animals this experiment.
B Corresponds to Group II of this experiment.

and the maintenance requirement of these animals. Some of the steers showed a gradual decrease in the maintenance cost from the beginning to the end of the experiment. In such cases it was found that the energy intake per 1,000 pounds had also decreased. On the other hand, steers with an increasing energy intake showed an increased maintenance requirement. Maintenance trials on young animals usually give higher results than have been obtained with mature animals, but if age does influence the maintenance requirement the effect is too slight to be shown in a live weight experiment of this kind.

Influence of Season.—The maintenance requirement of the steers in Groups I and II is slightly higher during the winter, as compared to the summer months. The animals in Group III however required considerably more energy for maintenance during the winter periods than they did in the summer periods. Presumably the energy expenditure incident to the greater consumption of feed by the steers of Groups I and II is sufficiently great to make unnecessary the oxidation of a large quantity of additional nutrients during the winter months in order to maintain the body temperature. This is not the case with the steers on a lower nutritional plane, and so during periods of prevailingly low temperatures they

must oxidize a larger amount of material in order to counteract the more rapid loss of heat from the body surface. The contrast between the two seasons is shown in Table 12.

TABLE 12.—DAILY MAINTENANCE REQUIREMENT IN THERMS OF CATTLE DURING SUMMER AND WINTER MONTHS.

	Group I	Group II	Group III
During Summer and Winter Months			
Calculated on basis of digestible organic matter consumed			
Summer	5.777	4.869	4.408
Winter	5.779	5.037	4.869
Calculated on basis of dry matter consumed			
Summer	5.523	4.483	3.921
Winter	5.770	4.444	4.164
Average of results obtained by the two methods			
Summer	5.650	4.676	4.165
Winter	5.775	4.741	4.517

SUMMARY AND DISCUSSION

There is a close relation between the amount of net energy consumed and the maintenance requirement. Periods of high energy intake were periods of high maintenance cost, while periods of low energy intake were accompanied by a lowered maintenance requirement.

The averages of all periods show the following daily maintenance requirements per 1,000 pounds live weight, in terms of net energy. Summer months: Group I, (high plane) 5.650 therms; Group II, (medium plane) 4.676 therms; Group III, (low plane) 4.165 therms. Winter months: Group I, 5.775 therms; Group II, 4.741 therms; Group III, 4.517 therms.

The maintenance requirement of Group I is about 20 percent higher than that of Group II, and about 30 percent higher than that of Group III.

If there is a definite relation between the age of animals and their maintenance requirements, it was obscured in this investigation by variations in the food intake.

The maintenance requirement of these animals is higher in the winter than in the summer.

BIBLIOGRAPHY

1. Waters, H. J.
1908—Capacity of Animals to Grow Under Adverse Conditions. Proc. Soc. Promotion Agr. Science **29th** Annual Meeting, p. 71.

2. Trowbridge, P. F., Moulton, C. R., Haigh, L. D.
1915—The Maintenance Requirement of Cattle, Missouri Agricultural Experiment Station, Research Bulletin 18.

3. Armsby, H. P.
1917—The Nutrition of Farm Animals. New York, The MacMillan Company.
(a) Page 306 (c) Page 719 (e) Page 54
(b) Page 291 (d) Page 652 (f) Page 400

4. Armsby, H. P., Fries, J. A.
1915—Net Energy of Feeding Stuffs for Cattle. Jour. Agr. Research Vol. **3**, p. 435.

5. Armsby, H. P., Fries, J. A.
1917—Influence of Degree of Fatness of Cattle Upon Their Utilization of Feed. Jour. Agr. Research, Vol. **11**, p. 451.

6. Benedict, F. G., Miles, W. R., Roth, Paul, Smith, H. M.
Human Vitality and Efficiency under Prolonged Restricted Diet. Carnegie Institution of Washington, Publication No. 280.

7. Shirky, S. B.
1919—The Extent to Which Growth Retarded During the Early Life of the Animal Can Be Regained. University of Missouri, Thesis for the degree, Master of Arts.

8. Fries, J. A.
1907—Investigations in the Use of the Bomb Calorimeter. U. S. Dept. of Agriculture, Bur. Animal Industry, Bulletin 94, p. 13.

9. Moulton, C. R.
1916—Units of Reference for Basal Metabolism and Their Interrelations. Jour. Biol. Chem., Vol. **24**, p. 299.

ORIGINAL DATA AND CALCULATIONS IN DETAIL

TABLE 13.—WEIGHT IN POUNDS OF ANIMALS, AND OF FEED CONSUMED BY THIRTY DAY PERIODS

Date beginning of period	Period No.	Live° weight *Pounds*	Grain *Pounds*	Hay *Pounds*	Milk *Pounds*	Date beginning of period	Period No.	Live° weight *Pounds*	Grain *Pounds*	Hay *Pounds*
Steer 585						**585 (Cont.)**				
5–22–14	1	143.1	.....	8.75	321	8– 5–17	40	495	15.0	220.5
6–21–14	2	155	5.00	15.5	317.5	9– 4–17	41	498	37.0	225.0
7–21–14	3	173	.....	59.5	300	10– 4–17	42	512	70.0	225.0
8–20–14	4	188	.....	90.0	300	11– 3–17	43	529	67.0	232.0
9–19–14	5	194	.....	104.0	299.8	12– 3–17	44	532	72.5	240.0
10–18–14	6	200	.....	120.0	290.0	1– 2–18	45	554	76.0	240.0
11–18–14	7	192	.....	140.0	100.0	2– 1–18	46	576	36.5	240.0
12–18–14	8	198	.....	150.0	.....	3– 3–18	47	586	50.0	236.0
1–17–15	9	193	.....	150.0	.....	4– 2–18	48	576	.....	225.0
2–16–15	10	194	.....	150.0	.....	5– 2–18	49	596	.....	224.5
3–18–15	11	218	.....	150.0	.....	6– 1–18	50	578	.....	240.0
4–17–15	12	223	.....	150.0	.....	7– 1–18	51	568	.....	240.0
5–17–15	13	229	.....	150.0	.....	7–31–18	52	554	.....	240.0
6–16–15	14	233	.....	155.0	.....	8–30–18	53	542	.....	253.0
7–17–15	15	235	11.75	153.5	.....	9–29–18	54	532	.....	255.0
8–16–15	16	251	36.7	163.5	.....	10–29–18	55	506	.....	263.5
9–15–15	17	256	47.0	150.5	.....	11–28–18	56	532	.....	278.0
10–14–15	18	272	60.0	154.0	.....	12–28–18	57	558	.....	328.5
11–14–15	19	290	60.0	180.0	.....	1–27–19	58	562	.....	317.0
12–14–15	20	303	60.0	180.0	.....	2–26–19	59	591	.....	330.0
1–13–16	21	312	60.0	180.0	.....	3–28–19	60	603	.....	330.0
2–12–16	22	337	56.5	180.0	.....	4–27–19	61	604	.....	317.5
3–13–16	23	345	34.0	180.0	.....	5–27–19	62	614	.....	326.5
4–12–16	24	356	30.0	180.0	.....	6–26–19	63	622	.....	335.0
5–12–16	25	360	30.0	180.0	.....	7–26–19	64	643	.....	360.0
6–11–16	26	361	31.5	180.0	.....	8–25–19	65	630	.....	360.0
7–11–16	27	370	45.0	180.0	.....	9–24–19	66	645	31.4	316.5
8–10–16	28	387	45.0	180.0	.....	10–24–19	67	653	60.0	333.0
9– 9–16	29	386	42.5	170.0	.....	11–23–19	68	688	58.0	257.5
10– 9–16	30	403	45.0	187.5	.....	12–23–19	69	682	60.0	334.0
11– 8–16	31	413	45.0	201.0	.....	1–22–20	70	716	60.0	360.0
12– 8–16	32	419	51.0	211.5	.....	2–21–20	71	741	60.0	360.0
1– 7–17	33	437	75.0	225.0	.....	3–22–20	72	763	60.0	360.0
2– 6–17	34	465	66.0	218.5	.....	4–21–20	73	785	60.0	360.0
3– 8–17	35	484	55.0	210.0	.....	5–21–20	74	825	60.0	359.0
4– 7–17	36	482	38.0	210.0	.....	6–20–20	75	850	60.0	360.0
5– 7–17	37	496	30.0	210.0	.....	7–20–20	76	858	60.0	359.0
6– 6–17	38	499	25.0	210.5	.....	8–19–20	77	878	60.0	360.0
7– 6–17	39	504	15.0	208.5	.....	9–18–20	78	885	60.0	360.0
Steer 579						**579 (Cont.)**				
5–30–14	1	154.0	.....	2.55	226	8– 5–17	40	709	75.0	225.0
6–21–14	2	183.9	7.3	14.5	374	9– 4–17	41	707	86.0	225.0
7–21–14	3	204.6	24.0	47.0	420	10– 4–17	42	725	141.5	231.0
8–20–14	4	240.0	30.0	60.5	208	11– 3–17	43	744	136.5	247.5
9–19–14	5	270	37.0	74.0	420	12– 3–17	44	758	147.0	251.5
10–18–14	6	304	45.0	90.0	420	1– 2–18	45	789	164.5	253.0
11–18–14	7	305	45.0	103.0	140	2– 1–18	46	820	120.0	255.0
12–18–14	8	316	45.0	120.0	.....	3– 3–18	47	822	67.0	255.0
1–17–15	9	321	45.0	120.0	.....	4– 2–18	48	831	73.5	255.5
2–16–15	10	322	45.0	122.0	.....	5– 2–18	49	851	22.5	292.5
3–18–15	11	335	45.0	120.0	.....	6– 1–18	50	834.5	.....	309.0

°Average weight of last ten days of period.

TABLE 13 (Continued).—WEIGHT IN POUNDS OF ANIMALS AND OF FEED CONSUMED BY THIRTY DAY PERIODS

Date beginning of period	Period No.	Live° weight *Pounds*	Grain *Pounds*	Hay *Pounds*	Milk *Pounds*	Date beginning of period	Period No.	Live° weight *Pounds*	Grain *Pounds*	Hay *Pounds*
Steer 579	**(Cont.)**					**Steer 579**	**(Cont.)**			
4–17–15	12	334	45.0	120.0	.....	7– 1–18	51	821	.....	315.0
5–17–15	13	344	45.0	120.0	.....	7–31–18	52	786	.....	315.0
6–16–15	14	344	50.0	120.0	.....	8–30–18	53	788	26.0	330.0
7–17–15	15	351	71.5	143.0	.....	9–29–18	54	781	2.0	339.0
8–16–15	16	379	76.25	178.0	.....	10–29–18	55	705	.....	253.0
9–15–15	17	399	70.0	180.0	.....	11–28–18	56	730	.....	304.5
10–14–15	18	409	60.0	180.0	.....	12–28–18	57	750	.....	330.0
11–14–15	19	419	64.5	184.5	.....	1–27–19	58	750	.....	351.5
12–14–15	20	430	76.5	194.0	.....	2–26–19	59	780	.....	360.0
1–13–16	21	434	75.0	195.0	.....	3–28–19	60	788	.....	360.0
2–12–16	22	453	75.0	195.0	.....	4–27–19	61	808	.....	357.0
3–13–16	23	469	75.0	195.0	.....	5–27–19	62	729	.....	287.0
4–12–16	24	489	75.0	195.0	.....	6–26–19	63	776	.....	326.0
5–12–16	25	495	74.0	194.0	.....	7–26–19	64	799	.....	359.0
6–11–16	26	505	68.0	180.0	.....	8–25–19	65	776	.....	360.0
7–11–16	27	521	75.0	180.0	.....	9–24–19	66	766	8.5	360.0
8–10–16	28	536	75.0	180.0	.....	10–24–19	67	771	59.0	360.0
9– 9–16	29	552	75.0	180.0	.....	11–25–19	68	782	60.0	360.0
10– 9–16	30	557	75.0	187.5	.....	12–23–19	69	797	60.0	329.5
11– 8–16	31	565	81.0	189.0	.....	1–22–20	70	823	60.0	360.0
12– 8–16	32	560	90.0	200.0	.....	2–21–20	71	843	60.0	360.0
1– 7–17	33	582	90.0	216.0	.....	3–22–20	72	855	60.0	360.0
2– 6–17	34	601	93.0	211.0	.....	4–21–20	73	857	60.0	360.0
3– 8–17	35	632	105.0	225.0	.....	5–21–20	74	866	59.0	328.0
4– 7–17	36	653	95.5	224.5	.....	6–20–20	75	893	60.0	360.0
5– 7–17	37	674	94.0	229.5	.....	7–20–20	76	910	60.0	358.0
6– 6–17	38	701	91.5	224.5	.....	8–19–20	77	907	60.0	360.0
7– 6–17	39	708	75.0	225.0	.....	9–19–20	78	918	60.0	360.0
Steer 528						**528 (Cont.)**				
6–11–14	1	179.0	.....	2.5	124.9	8– 5–17	40	1008	188.0	227.0
6–21–14	2	202.8	14.0	14.0	489	9– 4–17	41	1029	196.0	238.0
7–21–14	3	252.0	44.0	53.5	582	10– 4–17	42	1043	209.0	231.0
8–20–14	4	303.8	69.0	75.0	600	11– 3–17	43	1070	218.0	240.0
9–19–14	5	363.8	110.5	101.5	600	12– 3–17	44	1076	225.0	240.0
10–18–14	6	425.1	120.0	120.0	600	1– 2–18	45	1080	225.0	240.0
11–18–14	7	426.8	105.2	120.0	176	2– 1–18	46	1178	225.0	240.0
12–18–14	8	439.4	120.0	120.0	.....	3– 3–18	47	1147	225.0	240.0
1–17–15	9	457.2	120.0	120.0	.....	4– 2–18	48	1163	224.5	240.5
2–16–15	10	460.6	120.0	119.0	.....	5– 2–18	49	1184	150.0	293.5
3–18–15	11	482	120.0	120.0	.....	6– 1–18	50	1177	97.0	318.0
4–17–15	12	497	120.0	120.0	.....	7– 1–18	51	1159	28.0	330.0
5–17–15	13	507	120.0	120.0	.....	7–31–18	52	1139	30.0	330.0
6–16–15	14	517	120.0	130.0	.....	8–30–18	53	1122	30.0	330.0
7–17–15	15	527	120.0	150.0	.....	9–29–18	54	1107	30.0	336.0
8–16–15	16	559	145.7	152.0	.....	10–29–18	55	1103	87.0	333.0
9–15–15	17	586	150.0	180.0	.....	11–28–18	56	1122	120	353.5
10–14–15	18	620	150.0	180.0	.....	12–28–18	57	1155	120.0	357.5
11–14–15	19	629	155.0	184.5	.....	1–27–19	58	1158	120.0	360.0
12–14–15	20	651	165.0	195.0	.....	2–26–19	59	1172	150.5	360.0
1–13–16	21	659	165.0	195.0	.....	3–28–19	60	1211	150.0	360.0
2–12–16	22	678	165.0	195.0	.....	4–27–19	61	1231	150.0	360.0

°Average weight of last ten days of period.

TABLE 13 (Continued).—WEIGHT IN POUNDS OF ANIMALS AND OF FEED CONSUMED BY THIRTY DAY PERIODS

Date beginning of period	Period No.	Live° weight *Pounds*	Grain *Pounds*	Hay *Pounds*	Milk *Pounds*	Date beginning of period	Period No.	Live° weight *Pounds*	Grain *Pounds*	Hay *Pounds*
Steer 528	**(Cont.)**					**Steer 528**	**(Cont.)**			
3–13–16	23	699	165.0	195.0	.....	5–27–19	62	1258	150.0	360.0
4–12–16	24	727	165.0	195.0	.....	6–26–19	63	1244	149.0	357.0
5–12–16	25	745	165.0	195.0	.....	7–26–19	64	1267	150.0	360.0
6–11–16	26	768	165.0	194.5	.....	8–25–19	65	1278	150.0	360.0
7–11–16	27	785	165.0	180.0	.....	9–24–19	66	1278	150.0	360.0
8–10–16	28	805	165.0	180.5	.....	10–24–19	67	1274	150.0	360.0
9– 9–16	29	837	179.5	189.0	.....	11–23–19	68	1285	148.5	360.0
10– 9–16	30	869	180.0	202.5	.....	12–23–19	69	1304	150.0	360.0
11– 8–16	31	881	180.0	211.0	.....	1–22–20	70	1314	150.0	360.0
12– 8–16	32	878	180.0	214.5	.....	2–21–20	71	1333	150.0	360.0
1– 7–17	33	887	180.0	226.0	.....	3–22–20	72	1342	150.0	360.0
2– 6–17	34	915	180.0	225.0	.....	4–21–20	73	1341	150.0	360.0
3– 8–17	35	933	180.0	225.5	.....	5–21–20	74	1355	150.0	360.0
4– 7–17	36	942	180.0	225.0	.....	6–20–20	75	1367	150.0	360.0
5– 7–17	37	964	190.0	228.5	.....	7–20–20	76	1369	150.0	360.0
6– 6–17	38	986	180.0	225.0	.....	8–19–20	77	1381	147.0	348.0
7– 6–17	39	990	180.0	225.0	.....	9–19–20	78	1401	150.0	360.0

Date beginning of period	Period No.	Live° weight *Pounds*	Grain *Pounds*	Hay *Pounds*	Milk *Pounds*	Period No.	Live° weight *Pounds*	Grain *Pounds*	Hay *Pounds*	Milk *Pounds*
Steer 578						**Steer 577**				
8– 5–17	1	252	25.0	99.5	152.5	1	249	23.5	79.4	240.0
9– 4–17	2	268	44.3	111.0	216.4	2	272	33.0	104.1	236
10– 4–17	3	279	72.2	130.8	54.5	3	288	71.1	118.2	67.5
11– 8–17	4	314	90.0	140.4	.....	4	317	94.9	140.4	.....
12– 3–17	5	317	76.1	194.0	.....	5	339	105.0	194.4	.....
1– 2–18	6	331	81.0	164.5	.....	6	361	105.5	164.5	.....
2– 1–18	7	365	81.6	165.0	.....	7	404	107.5	165.0	.....
3– 3–18	8	383	29.0	164.0	.....	8	441	120.0	165.0	.....
4– 2–18	9	378	21.5	165.5	.....	9	472	119.5	165.5	.....
5– 2–18	10	411	10.0	192.0	.....	10	504	91.5	195.0	.....
6– 1–18	11	418	.....	196.0	.....	11	524	90.0	198.5	.....
7– 1–18	12	413	.....	195.0	.....	12	538	90.0	210.0	.....
7–31–18	13	402	.....	195.0	.....	13	555	90.0	210.0	.....
8–30–18	14	393	.....	208.0	.....	14	560	90.0	223.0	.....
9–29–18	15	383	.....	210.0	.....	15	578	90.0	225.0	.....
10–29–18	16	372	2.0	210.0	.....	16	599	113.0	211.5	.....
11–28–18	17	375	.....	233.5	.....	17	617	120.0	210.0	.....
12–28–18	18	395	.....	226.5	.....	18	640	120.0	210.0	.....
1–27–19	19	409	.....	240.0	.....	19	671	120.0	231.0	.....
2–26–19	20	432	.....	240.0	.....	20	690	120.0	240.0	.....
3–28–19	21	438	.....	240.0	.....	21	730	120.0	240.0	.....
4–27–19	22	455	.....	240.0	.....	22	750	119.0	228.5	.....
5–27–19	23	458	.....	241.5	.....	23	764	120.0	240.0	.....
6–26–19	24	457	.....	245.0	.....	24	778	120.0	240.0	.....
7–26–19	25	466	17.0	269.0	.....	25	813	119.0	240.0	.....
8–25–19	26	490	30.0	270.0	.....	26	820	120.0	239.0	.....
9–24–19	27	496	30.5	270.0	.....	27	810	107.5	226.5	.....

°Average weight of last ten days of period.

TABLE 13 (Continued).—WEIGHT IN POUNDS OF ANIMALS AND OF FEED CONSUMED BY THIRTY DAY PERIODS

Date beginning of period	Period No.	Live° weight *Pounds*	Grain *Pounds*	Hay *Pounds*	Milk *Pounds*	Period No.	Live° weight *Pounds*	Grain *Pounds*	Hay *Pounds*	Milk *Pounds*
Steer 578	**(Cont.)**					**Steer**	**577 (Co**	**nt.)**		
10-24-19	28	512	30.0	270.0	.....	28	833	120.0	258.0	.....
11-23-19	29	519	30.0	270.0	.....	29	855	120.0	270.0	.....
12-23-19	30	541	30.0	270.0	.....	30	875	120.0	270.0	.....
1-22-20	31	555	30.0	270.0	.....	31	905	120.0	270.0	.....
2-21-20	32	580	30.0	270.0	.....	32	915	120.0	270.0	.....
3-22-20	33	595	30.0	270.0	.....	33	941	120.0	270.0	.....
4-21-20	34	580	30.0	270.0	.....	34	957	120.0	270.0	.....
5-21-20	35	591	30.0	270.0	.....	35	966	120.0	270.0	.....
6-20-20	36	696	30.0	270.0	.....	36	976	120.0	270 0	.....
7-20-20	37	613	30.0	270.0	.....	37	995	120.0	270.0	.....
8-19-20	38	603	30.0	270.0	.....	38	990	120.0	270.0	.....
9-18-20	39	619	30.0	270.0	.....	39	1000	120.0	270.0	.....
Steer 575						**Steer**	**574**			
8- 5-17	1	217	13.4	75.8	2.35	1	242	18.0	78.6	240.0
9- 4-17	2	227	.2	75.0	236.5	2	244	9.8	90.0	226.9
10- 4-17	3	228	.....	109.0	67.0	3	252	23.4	126.2	62.5
11- 3-17	4	237	17.1	135.0	.....	4	264	45.0	141.0	.....
12- 3-17	5	246	30.0	143.9	.....	5	268	46.5	150.0	.....
1- 2-18	6	257	30.0	164.5	.....	6	284	51.0	164.5	.....
2- 1-18	7	275	18.3	165.0	.....	7	309	51.2	165.0	.....
3- 3-18	8	283	.....	155.0	.....	8	315	11.5	165.0	.....
4- 2-18	9	290	.....	150.0	.....	9	315	5.5	165.0	.....
5- 2-18	10	308	.....	150.0	.....	10	337	.....	174.0	.....
6- 1-18	11	304	.....	150.0	.....	11	337	.....	174.0	.....
7- 1-18	12	307	.....	150.0	.....	12	332	.....	180.0	.....
7-31-18	13	294	.....	150.0	.....	13	322	.....	180.0	.....
8-30-18	14	298	.....	161.5	.....	14	324	.....	193.0	.....
9-29-18	15	299	.....	165.0	.....	15	321	.....	195.0	.....
10-29-18	16	294	27.5	152.5	.....	16	316	.....	210.5	.....
11-28-18	17	295	53.5	151.0	.....	17	309	32.5	192.5	.....
12-28-18	18	308	59.0	148.0	.....	18	321	60.0	175.5	.....
1-27-19	19	328	60.0	150.0	.....	19	333	60.0	180.0	.....
2-26-19	20	343	60.0	150.0	.....	20	348	60.0	180.0	.....
3-28-19	21	358	60.0	150.0	.....	21	368	60.0	180.0	.....
4-27-19	22	380	60.0	150.0	.....	22	382	60.0	180.0	.....
5-27-19	23	394	60.0	154.0	.....	23	412	60.0	180.0	.....
6-26-19	24	409	60.0	179.0	.....	24	417	60.0	180.0	.....
7-26-19	25	426	60.0	180.0	.....	25	445	60.0	180.0	.....
8-25-19	26	425	60.0	180.0	.....	26	445	60.0	180.0	.....
9-24-19	27	436	60.0	180.0	.....	27	432	60.0	180.0	.....
10-24-19	28	441	60.0	180.0	.....	28	439	60.0	180.0	.....
11-23-19	29	447	60.0	180.0	.....	29	435	60.0	180.0	.....
12-23-19	30	458	60.0	180.5	.....	30	448	60.0	180.5	.....
1-22-20	31	472	60.0	180.0	.....	31	453	60.0	180.0	.....
2-21-20	32	480	60.0	180.0	.....	32	464	60.0	180.0	.....
3-22-20	33	496	60.0	180.0	.....	33	474	60.0	180.0	.....
4-21-20	34	504	60.0	180.0	.....	34	481	60.0	180.0	.....
5-21-20	35	515	60.0	180.0	.....	35	499	60.0	180.0	.....
6-20-20	36	528	60.0	180.0	.....	36	511	60.0	180.0	.....
7-20-20	37	538	60.0	180.0	.....	37	518	60.0	180.0	.....
8-19-20	38	530	60.0	180.0	.....	38	506	60.0	180.0	.....
9-18-20	39	537	60.0	180.0	.....	39	518	60.0	180.0	.....

°Average weight of last ten days of period.

TABLE 13 (Continued).—WEIGHT IN POUNDS OF ANIMALS AND OF FEED CONSUMED BY THIRTY DAY PERIODS

Date beginning of period	Period No.	Live weight *Pounds*	Grain *Pounds*	Hay *Pounds*	Milk *Pounds*	Period No.	Live weight *Pounds*	Grain *Pounds*	Hay *Pounds*	Milk *Pounds*
Steer 573						**Steer 572**				
8- 5-17	1	197	14.1	64.9	214.0	1	210	16.4	72.6	215.4
9- 4-17	2	220	34.1	102.3	253.0	2	216	22.1	92.1	42.3
10- 4-17	3	237	75.7	108.4	50.5	3	231	28.8	124.9	.....
11- 3-17	4	269	105.8	128.1	.....	4	243	30.0	134.5	.....
12- 3-17	5	290	87.5	145.4	.....	5	252	30.0	146.5	.....
1- 2-18	6	312	72.0	164.3	.....	6	263	30.0	150.0	.....
2- 1-18	7	335	62.5	165.0	.....	7	280	16.3	154.5	.....
3- 3-18	8	345	30.0	165.0	.....	8	289	.....	155.0	.....
4- 2-18	9	354	29.5	165.6	.....	9	295	0.5	150.0	.....
5- 2-18	10	366	15.0	192.0	.....	10	305	.....	150.0	.....
6- 1-18	11	364	6.0	202.5	.....	11	307	.....	150.0	.....
7- 1-18	12	369	.....	210.0	.....	12	311	.....	150.0	.....
7-31-18	13	355	.....	210.0	.....	13	306	.....	150.0	.....
8-30-18	14	367	.....	223.0	.....	14	304	.....	165.0	.....
9-29-18	15	364	.....	225.0	.....	15	309	.....	165.0	.....
10-29-18	16	361	.....	213.5	.....	16	309	.....	179.0	.....
11-28-18	17	339	9.5	167.5	.....	17	304	.....	182.0	.....
12-28-18	18	354	30.0	180.5	.....	18	309	.....	180.0	.....
1-27-19	19	383	30.0	221.5	.....	19	317	.....	187.0	.....
2-26-19	20	399	30.0	221.5	.....	20	328	.....	210.0	.....
3-28-19	21	406	43.0	213.5	.....	21	341	.....	210.0	.....
4-27-19	22	431	60.0	210.0	.....	22	358	.....	210.0	.....
5-27-19	23	438	60.0	212.5	.....	23	362	.....	206.0	.....
6-26-19	24	454	60.0	217.5	.....	24	370	.....	210.5	.....
7-26-19	25	477	60.0	209.0	.....	25	375	.....	210.0	.....
8-25-19	26	492	60.0	210.0	.....	26	380	.....	210.0	.....
9-24-19	27	485	60.0	206.0	.....	27	378	.....	210.0	.....
10-24-19	28	499	60.0	200.5	.....	28	375	.....	210.0	.....
11-23-19	29	503	60.0	210.5	.....	29	372	.....	224.5	.....
12-23-19	30	522	60.0	209.5	.....	30	392	.....	241.5	.....
1-22-20	31	532	60.0	210.0	.....	31	414	.....	254.0	.....
2-21-20	32	537	60.0	210.0	.....	32	434	.....	270.0	.....
3-22-20	33	552	60.0	210.0	.....	33	448	.....	270.0	.....
4-21-20	34	557	60.0	210.0	.....	34	433	.....	238.5	.....
5-21-20	35	569	60.0	210.0	.....	35	460	.....	270.0	.....
6-20-20	36	581	60.0	210.0	.....	36	469	.....	270.0	.....
7-20-20	37	595	60.0	210.0	.....	37	479	.....	270.0	.....
8-19-20	38	588	60.0	210.0	.....	38	485	.....	270.0	.....
9-18-20	39	594	60.0	209.5	.....	39	488	.....	270.0	.....
Steer 571										
8- 5-17	1	173	24.5	79.3	82.8	.....	.....	.....	.....	.....
9- 4-17	2	181	32.5	103.0	.....	.....	.....	.....	.....	.....
10- 4-17	3	200	81.1	96.9	.....	.....	.....	.....	.....	.....
11- 3-17	4	237	109.6	111.0	.....	.....	.....	.....	.....	.....
12- 3-17	5	264	105.9	123.3	.....	.....	.....	.....	.....	.....
1- 2-18	6	288	102.0	134.8	.....	.....	.....	.....	.....	.....
2- 1-18	7	321	102.0	136.5	.....	.....	.....	.....	.....	.....
3- 3-18	8	355	102.0	135.0	.....	.....	.....	.....	.....	.....
4- 2-18	9	383	103.0	142.0	.....	.....	.....	.....	.....	.....
5- 2-18	10	412	76.0	177.5	.....	.....	.....	.....	.....	.....
6- 1-18	11	433	70.0	189.0	.....	.....	.....	.....	.....	.....

TABLE 13 (Continued).—WEIGHT IN POUNDS OF ANIMALS AND OF FEED CONSUMED BY THIRTY DAY PERIODS

Date beginning of period	Period No.	Live weight *Pounds*	Grain *Pounds*	Hay *Pounds*	Milk *Pounds*	Period No.	Live weight *Pounds*	Grain *Pounds*	Hay *Pounds*	Milk *Pounds*
Steer 571	**(Cont.)**									
7- 1-18	12	453	75.0	195.0	.....	.....	.....	.....	.....	.....
7-31-18	13	469	75.0	195.0	.....	.....	.....	.....	.....	.....
8-30-18	14	478	75.0	208.0	.....	.....	.....	.....	.....	.....
9-29-18	15	483	75.0	210.0	.....	.....	.....	.....	.....	.....
10-29-18	16	494	88.5	210.5	.....	.....	.....	.....	.....	.....
11-28-18	17	499	90.0	163.0	.....	.....	.....	.....	.....	.....
12-28-18	18	510	90.0	180.5	.....	.....	.....	.....	.....	.....
1-27-19	19	536	90.0	207.0	.....	.....	.....	.....	.....	.....
2-26-19	20	559	90.0	210.0	.....	.....	.....	.....	.....	.....
3-28-19	21	502	90.5	210.0	.....	.....	.....	.....	.....	.....
4-27-19	22	496	90.0	210.0	.....	.....	.....	.....	.....	.....
5-27-19	23	612	90.0	210.0	.....	.....	.....	.....	.....	.....
6-26-19	24	616	88.5	206.5	.....	.....	.....	.....	.....	.....
7-26-19	25	635	90.0	210.0	.....	.....	.....	.....	.....	.....
8-25-19	26	637	89.9	210.0	.....	.....	.....	.....	.....	.....
9-24-19	27	617	90.0	213.0	.....	.....	.....	.....	.....	.....
10-24-19	28	627	90.0	230.0	.....	.....	.....	.....	.....	.....
11-23-19	29	649	90.0	242.0	.....	.....	.....	.....	.....	.....
12-23-19	30	667	90.0	240.0	.....	.....	.....	.....	.....	.....
1-22-20	31	681	88.5	228.5	.....	.....	.....	.....	.....	.....
2-21-20	32	699	90.0	240.0	.....	.....	.....	.....	.....	.....
3-22-20	33	716	90.0	240.0	.....	.....	.....	.....	.....	.....
4-21-20	34	727	90.0	240.0	.....	.....	.....	.....	.....	.....
5-21-20	35	747	90.0	240.0	.....	.....	.....	.....	.....	.....
6-20-20	36	755	90.0	240.0	.....	.....	.....	.....	.....	.....
7-20-20	37	754	90.0	240.0	.....	.....	.....	.....	.....	.....
8-19-20	38	752	90.0	240.0	.....	.....	.....	.....	.....	.....
9-18-20	39	757	90.0	240.0	.....	.....	.....	.....	.....	.....

TABLE 14.—DRY MATTER AND ORGANIC MATTER IN FEED BY 30-DAY PERIODS

Period	Dry matter in grain *Pounds*	Dry matter in hay *Pounds*	Organic matter in grain *Pounds*	Organic matter in hay *Pounds*	Total organic matter *Pounds*	Digestible organic matter *Pounds*
Steer 585						
1	.....	8.020	.....	7.655	7.655	4.464
2	4.714	14.211	4.548	18.107	13.559	11.480
3	.....	53.811	.....	48.683	48.683	28.392
4	.....	84.158	.....	67.090	76.090	44.376
5	.....	97.228	.....	87.906	87.906	51.267
6	26.974	111.024	.....	100.449	100.449	58.582
7	.....	127.800	.....	115.769	115.769	67.516
8	.....	136.098	.....	123.498	123.498	72.024
9	.....	136.098	.....	123.498	123.498	72.024
10	.....	136.098	.....	123.498	123.498	72.024
11	.....	136.098	.....	123.498	123.498	72.024
12	.....	136.098	.....	123.498	123.498	72.024
13	.....	136.098	.....	123.498	123.498	72.024
14	.....	144.047	.....	131.017	131.017	76.409
15	10.616	142.540	10.231	129.640	139.871	84.342
16	33.196	151.424	31.983	138.174	170.157	102.605
17	61.760	139.866	60.208	138.656	188.864	113.885
18	54.639	143.105	52.691	129.375	182.066	115.430
19	54.330	167.263	52.394	51.213	103.617	65.687
20	53.710	168.654	51.810	152.515	204.324	129.542
21	53.724	178.837	51.847	162.701	214.548	136.023
22	50.568	164.763	48.801	148.733	197.534	125.236
23	30.431	164.763	29.311	148.733	178.044	110.904
24	27.072	165.125	26.013	149.135	175.148	109.100
25	27.072	165.125	26.013	149.135	175.148	109.100
26	28.422	164.641	27.311	157.199	184.510	114.931
27	40.609	166.170	39.021	152.310	191.331	121.304
28	40.609	166.170	39.021	152.310	191.331	121.304
29	38.357	156.923	36.857	143.843	180.700	114.564
30	40.228	172.617	38.630	158.217	196.837	124.795
31	39.846	185.540	38.217	170.070	208.287	132.054
32	45.156	193.915	43.311	176.576	219.887	139.408
33	66.404	207.059	63.690	187.969	251.659	159.552
34	58.432	201.112	56.044	182.562	238.606	151.276
35	48.702	193.255	46.712	175.435	222.147	140.841
36	33.684	193.255	32.324	175.435	207.759	129.413
37	26.769	193.255	25.721	175.435	201.156	125.300
38	22.343	193.255	21.477	175.435	196.912	118.738
39	13.406	191.933	12.886	174.233	187.119	112.833
40	13.406	202.915	12.886	184.205	197.091	118.846
41	33.063	207.059	31.781	187.969	219.750	136.882
42	62.557	210.216	60.132	191.418	251.550	159.483
43	59.770	218.126	57.487	198.876	256.363	162.534
44	64.609	221.997	62.164	201.753	263.917	167.323
45	67.736	219.940	65.172	199.900	265.072	168.056
46	32.538	219.940	31.307	199.900	231.207	144.019
47	44.566	215.383	42.880	195.753	238.633	151.283
48	.....	207.593	.....	187.163	187.163	109.143
49	.....	206.844	.....	187.950	187.950	109.612
50	.....	219.508	.....	199.066	199.066	116.095
51	.....	222.130	.....	197.050	197.050	114.920
52	.....	222.130	.....	197.050	197.050	114.920
53	.....	234.484	.....	208.361	208.361	121.516

TABLE 14 (Continued).—DRY MATTER AND ORGANIC MATTER IN FEED BY 30-DAY PERIODS

Period	Dry matter in grain *Pounds*	Dry matter in hay *Pounds*	Organic matter in grain *Pounds*	Organic matter in hay *Pounds*	Total organic matter *Pounds*	Digestible organic matter *Pounds*
Steer 585 (Cont.)						
54	.....	236.436	.....	210.176	210.176	122.575
55	.....	243.117	.....	215.919	215.919	125.924
56	.....	244.898	.....	215.688	215.688	125.789
57	.....	289.470	.....	254.970	254.970	148.698
58	.....	279.340	.....	246.020	246.020	143.479
59	.....	290.748	.....	256.060	256.060	143.502
60	.....	290.740	.....	256.060	256.060	149.354
61	.....	281.412	.....	249.172	249.172	145.317
62	.....	291.199	.....	260.959	260.959	152.191
63	.....	297.227	.....	267.117	267.117	155.783
64	.....	319.520	.....	287.150	287.150	167.466
65	.....	319.520	.....	287.150	287.150	167.466
66	27.663	280.876	26.661	252.426	279.087	168.298
67	52.877	304.072	50.961	275.429	326.390	196.813
68	51.105	275.950	49.254	254.840	304.094	192.796
69	53.460	297.126	51.281	269.746	321.027	199.968
70	53.460	320.353	51.281	290.853	342.134	213.115
71	53.460	320.353	51.281	290.853	342.134	213.115
72	53.460	320.353	51.281	290.853	342.134	213.115
73	54.787	320.353	51.513	290.853	342.366	283.260
74	55.552	319.243	53.227	289.813	343.040	213.680
75	55.552	320.353	53.227	290.853	344.080	214.327
76	55.552	324.764	53.227	294.509	347.836	216.667
77	55.552	338.393	53.227	305.928	358.155	223.095
78	53.233	338.393	50.292	305.928	355.221	221.267
Steer 579						
1	.....	2.337	.....	2.230	2.230	1.301
2	6.835	13.297	6.595	12.687	19.289	12.406
3	21.317	41.92	20.434	37.937	58.371	37.556
4	26.663	56.577	25.563	51.153	76.716	49.359
5	33.813	69.177	32.228	62.544	94.772	60.976
6	39.738	82.904	38.192	75.032	113.224	72.848
7	39.738	66.513	38.172	57.667	95.839	61.662
8	39.738	108.874	38.192	98.804	136.996	88.143
9	40.674	108.874	39.156	98.804	137.960	88.763
10	40.614	110.697	39.152	100.447	139.599	89.817
11	40.614	108.874	39.152	98.804	137.956	88.761
12	40.614	108.874	39.152	98.804	137.956	88.761
13	40.614	108.874	39.152	98.804	137.956	88.761
14	45.162	114.739	43.540	104.549	148.189	95.345
15	64.604	132.805	62.276	120.795	183.071	117.788
16	68.975	168.623	66.455	154.178	220.633	141.955
17	61.512	167.275	59.199	153.855	213.054	137.079
18	54.639	167.253	52.691	151.213	203.904	131.191
19	58.361	171.440	56.282	155.000	211.282	133.953
20	68.488	180.275	66.066	162.906	228.972	147.321
21	67.142	179.823	64.796	162.344	227.140	146.142
22	67.142	178.459	64.796	161.099	225.895	145.341
23	67.129	178.459	64.642	161.099	225.741	145.242
24	67.677	179.865	65.031	161.545	226.576	145.779
25	66.766	177.97	64.155	160.730	224.885	144.691

TABLE 14 (Continued).—DRY MATTER AND ORGANIC MATTER IN FEED BY 30-DAY PERIODS

Period	Dry matter in grain *Pounds*	Dry matter in hay *Pounds*	Organic matter in grain *Pounds*	Organic matter in hay *Pounds*	Total organic matter *Pounds*	Digestible organic matter *Pounds*
Steer 579 (Cont.)						
26	61.361	165.772	58.961	151.134	210.095	135.175
27	67.677	166.17	65.031	152.310	217.341	139.837
28	67.677	166.17	65.031	152.31	217.341	139.837
29	67.677	166.17	65.031	152.31	217.341	139.837
30	73.553	173.084	70.868	158.654	229.523	147.675
31	71.727	174.565	68.796	159.945	228.741	147.171
32	79.687	184.228	76.431	167.765	244.196	157.116
33	79.687	198.794	76.431	180.464	256.895	165.286
34	82.341	194.189	78.976	176.279	255.255	164.231
35	92.967	207.059	89.168	187.969	277.137	178.309
36	84.667	206.591	81.239	187.541	268.770	172.927
37	83.882	211.187	80.602	191.717	272.319	175.210
38	81.771	206.591	78.600	187.541	266.141	171.235
39	67.068	207.059	64.469	187.969	252.438	160.046
40	67.068	207.059	64.469	187.969	252.438	160.046
41	76.865	207.059	73.885	187.261	261.854	166.015
42	126.453	215.797	121.550	196.499	318.049	204.633
43	121.745	232.210	117.109	211.670	328.779	211.536
44	131.020	232.557	126.062	211.336	337.398	217.082
45	146.614	231.830	141.067	210.700	351.767	226.327
46	106.958	233.635	102.910	212.335	315.245	202.829
47	59.722	233.635	57.462	212.335	269.797	171.051
48	65.942	235.717	63.459	212.527	275.986	174.975
49	20.256	269.474	19.495	244.911	264.406	159.437
50	.....	282.572	.....	256.351	256.351	149.504
51	.....	291.554	.....	258.634	258.634	150.835
52	.....	291.554	.....	258.634	258.634	150.835
53	23.476	308.734	22.572	274.357	296.929	179.048
54	1.805	314.352	1.736	279.442	281.178	163.983
55	.....	233.442	.....	207.339	207.339	120.920
56	.....	268.290	.....	236.290	236.290	137.805
57	.....	290.760	.....	256.080	256.080	149.346
58	.....	309.700	.....	272.760	272.760	159.074
59	.....	278.747	.....	240.907	240.907	140.497
60	.....	278.747	.....	240.907	240.907	140.497
61	.....	316.923	.....	280.723	280.723	163.718
62	.....	256.276	.....	229.544	229.544	133.870
63	.....	289.234	.....	259.924	259.924	151.588
64	.....	318.530	.....	286.250	285.250	166.941
65	.....	319.620	.....	287.150	287.150	167.466
66	7.489	19.520	7.218	287.150	294.368	171.675
67	51.991	320.059	50.107	289.896	340.003	198.290
68	53.442	317.243	51.279	287.753	339.032	211.183
69	53.460	293.057	51.281	266.047	317.328	197.664
70	53.460	293.057	51.281	266.047	317.328	197.664
71	53.460	293.057	51.281	266.047	317.328	197.664
72	53.460	293.057	51.281	266.047	317.328	197.664
73	54.556	317.243	52.576	287.753	340.329	205.218
74	54.629	291.776	52.340	264.906	317.246	191.299
75	55.555	325.603	53.227	295.275	348.502	210.147
76	55.555	338.393	53.227	305.928	359.155	216.570
77	55.555	338.393	53.227	305.928	359.155	216.570
78	53.233	338.393	50.293	305.928	356.221	214.801

TABLE 14 (Continued).—DRY MATTER AND ORGANIC MATTER IN FEED BY 30-DAY PERIODS

Period	Dry matter in grain *Pounds*	Dry matter in hay *Pounds*	Organic matter in grain *Pounds*	Organic matter in hay *Pounds*	Total organic matter *Pounds*	Digestible organic matter *Pounds*
Steer 528						
1	.....	2.292	.....	2.187	2.187	1.275
2	13.199	12.836	12.735	12.247	24.982	17.377
3	24.449	48.210	18.829	43.620	62.449	43.440
4	61.320	70.133	58.791	63.410	122.201	85.003
5	97.749	94.913	93.861	85.814	179.675	124.982
6	105.963	110.548	101.839	100.052	201.891	140.435
7	92.871	109.557	89.255	99.249	188.504	131.123
8	106.422	108.884	102.297	98.804	201.101	139.886
9	108.485	108.485	104.436	104.436	208.872	145.291
10	108.311	107.972	104.411	97.977	202.388	140.781
11	108.311	108.884	104.411	98.804	203.215	141.356
12	108.311	108.884	104.411	98.804	203.215	141.356
13	108.311	108.884	104.411	98.804	203.215	141.356
14	108.322	120.711	104.430	109.791	214.221	149.012
15	108.374	138.046	104.467	125.436	229.903	159.921
16	131.778	141.910	126.964	130.344	257.308	178.983
17	135.684	167.303	130.728	153.883	284.611	197.975
18	136.606	167.253	131.736	151.213	282.949	196.819
19	140.308	171.440	135.309	155.000	290.309	210.939
20	147.715	181.653	142.492	164.154	306.646	213.303
21	147.658	179.823	142.496	162.244	304.740	211.977
22	147.658	178.459	142.496	161.099	303.595	211.181
23	147.668	178.459	142.194	161.099	303.293	210.971
24	148.916	178.865	143.094	161.545	304.639	211.907
25	148.916	178.865	143.094	161.545	304.639	211.907
26	148.916	179.161	143.094	163.418	306.512	213.210
27	148.916	166.170	143.094	152.310	295.404	205.483
28	148.916	166.638	143.094	152.738	295.832	205.781
29	162.008	174.495	155.674	159.945	315.619	219.545
30	160.901	186.971	154.469	171.381	325.840	226.654
31	159.286	294.778	152.773	178.528	331.301	230.459
32	159.286	197.634	152.773	179.975	332.748	231.459
33	159.286	207.974	152.773	188.794	341.567	237.594
34	159.286	207.059	152.773	187.969	340.742	237.020
35	159.286	207.547	152.773	188.407	340.180	236.629
36	159.615	207.059	153.136	187.969	341.105	237.273
37	169.556	210.292	162.924	190.892	353.816	246.114
38	160.889	207.059	154.652	187.969	342.621	238.327
39	160.889	207.059	154.652	187.969	342.621	238.327
40	168.125	208.878	161.610	189.218	351.228	244.314
41	175.158	219.033	168.366	198.833	367.199	255.424
42	186.821	215.766	179.570	196.467	376.037	261.571
43	200.193	225.637	192.791	205.717	398.508	277.202
44	200.504	221.956	192.914	201.706	394.620	274.498
45	200.504	219.940	192.914	199.900	392.814	273.241
46	200.504	219.940	192.914	199.900	392.814	273.241
47	200.504	219.940	192.914	199.900	392.814	273.241
48	201.409	221.858	193.821	200.028	393.849	273.961
49	132.998	270.416	129.924	145.763	375.687	241.717
50	87.287	290.807	84.007	263.791	347.798	223.773
51	25.168	305.412	24.211	270.932	295.143	177.971
52	27.026	305.412	26.539	270.932	297.471	179.375

TABLE 14 (Continued).—DRY MATTER AND ORGANIC MATTER IN FEED BY 30-DAY PERIODS

Period	Dry matter in grain *Pounds*	Dry matter in hay *Pounds*	Organic matter in grain *Pounds*	Organic matter in hay *Pounds*	Total organic matter *Pounds*	Digestible organic matter *Pounds*
Steer 528 (Cont.)						
53	27.085	306.048	26.042	271.986	298.028	179.711
54	27.085	311.443	26.042	276.843	302.885	182.640
55	78.548	307.178	75.522	272.820	348.342	220.848
56	107.548	311.360	103.381	274.210	377.591	239.393
57	105.910	314.960	101.791	277.380	378.171	240.394
58	105.576	317.150	101.468	279.310	380.778	241.413
59	132.253	317.150	127.092	279.310	406.392	261.472
60	131.819	317.150	126.665	297.310	405.975	261.204
61	131.006	319.497	126.089	283.017	409.106	263.219
62	130.710	321.207	125.894	287.909	413.803	266.241
63	131.769	316.860	126.888	284.760	411.648	264.854
64	132.111	319.520	127.268	287.150	414.418	266.637
65	132.181	319.520	127.392	287.150	414.542	266.716
66	132.181	319.520	127.392	287.150	414.542	266.716
67	132.181	320.062	127.392	289.899	417.291	268.485
68	132.249	320.273	126.891	290.783	417.670	268.731
69	133.678	320.273	128.232	290.783	419.015	269.594
70	133.678	320.273	128.232	290.783	419.015	269.594
71	133.678	320.273	128.232	290.783	419.015	269.594
72	122.678	320.273	128.232	290.783	419.015	269.594
73	136.974	320.027	131.291	290.783	422.074	271.562
74	136.573	320.027	130.850	290.783	421.633	271.279
75	138.888	320.027	130.850	290.783	421.633	271.279
76	138.888	320.061	130.850	290.246	421.096	270.933
77	136.110	327.113	130.407	295.730	426.137	274.177
78	133.085	338.093	125.734	305.928	431.662	277.731
Steer 578						
1	22.361	104.971	21.945	96.528	118.023	74.827
2	39.593	102.156	38.058	92.737	130.795	82.924
3	64.522	124.266	62.020	111.347	173.367	111.544
4	80.281	131.978	77.222	120.328	197.550	127.104
5	67.831	180.588	65.270	164.178	229.448	147.627
6	72.191	150.751	69.459	137.011	206.470	132.843
7	112.607	151.207	109.855	137.427	247.232	159.101
8	25.852	151.207	24.874	137.427	162.301	102.899
9	19.304	152.693	18.577	137.668	156.245	94.216
10	8.998	176.927	8.660	160.696	169.356	98.768
11	.....	180.748	.....	161.434	161.434	94.148
12	.....	180.485	.....	160.100	160.100	93.370
13	.....	180.485	.....	160.100	160.100	93.370
14	.....	192.763	.....	171.302	171.302	99.903
15	.....	194.679	.....	173.056	173.056	100.926
16	1.805	159.232	1.736	144.700	146.436	85.400
17	.....	204.744	.....	180.211	180.211	105.099
18	.....	199.535	.....	175.740	175.740	102.492
19	.....	211.430	.....	186.214	186.214	108.600
20	.....	211.430	.....	186.214	186.214	108.600
21	.....	211.430	.....	186.214	186.214	108.600
22	.....	212.996	.....	188.682	188.682	110.039
23	.....	215.343	.....	193.013	193.013	112.565
24	.....	217.377	.....	195.347	195.347	113.926

TABLE 14 (Continued).—DRY MATTER AND ORGANIC MATTER IN FEED BY 30-DAY PERIODS

Period	Dry matter in grain *Pounds*	Dry matter in hay *Pounds*	Organic matter in grain *Pounds*	Organic matter in hay *Pounds*	Total organic matter *Pounds*	Digestible organic matter *Pounds*
Steer 578 (Cont.)						
25	14.981	238.663	14.438	214.483	228.921	133.507
26	26.438	239.560	25.480	215.280	240.760	145.178
27	26.879	239.560	25.905	215.280	241.185	145.435
28	26.438	216.989	25.480	194.367	219.847	132.568
29	26.718	240.187	25.633	218.066	243.699	146.950
30	26.727	240.187	25.638	218.066	243.704	146.954
31	26.727	240.187	25.638	218.066	243.704	146.954
32	26.727	240.187	25.638	218.066	243.704	146.954
33	26.727	240.187	25.638	218.066	243.704	146.954
34	27.065	240.187	26.652	218.006	244.718	147.565
35	27.778	240.187	26.614	218.066	244.680	147.542
36	27.778	240.187	26.614	218.066	244.680	147.542
37	27.778	244.278	26.614	221.518	248.132	149.624
38	27.778	253.795	26.614	229.446	256.060	154.404
39	26.616	253.795	25.147	229.446	254.593	153.520
Steer 577						
1	18.999	73.079	18.185	66.338	84.523	53.588
2	29.488	94.806	28.344	85.969	114.313	72.474
3	63.460	110.490	61.000	100.619	161.619	108.204
4	84.664	121.482	81.436	120.317	201.750	135.072
5	93.583	180.626	90.041	163.214	253.255	169.554
6	93.583	150.736	90.041	136.996	237.037	158.696
7	95.834	151.206	92.208	137.426	229.634	153.740
8	106.958	151.206	102.910	137.426	240.336	160.905
9	107.214	152.228	103.176	137.248	240.424	160.964
10	82.340	179.679	79.245	163.279	242.524	156.040
11	80.991	181.545	77.947	164.658	242.605	156.092
12	80.889	194.372	77.812	172.419	250.231	160.999
13	81.809	194.372	78.276	172.419	250.695	161.297
14	81.260	206.674	78.130	183.643	261.773	168.425
15	81.260	208.596	78.130	185.426	263.556	169.572
16	102.026	224.104	98.096	202.282	300.378	193.263
17	107.569	185.009	103.402	162.939	266.341	171.364
18	105.926	185.009	101.801	162.939	264.740	170.334
19	105.602	203.512	101.493	179.233	280.726	180.619
20	105.460	211.451	101.337	186.221	287.558	185.015
21	105.460	211.451	101.337	186.221	287.558	185.015
22	103.973	202.745	100.071	179.586	279.657	179.931
23	104.567	211.007	100.714	191.817	292.531	188.214
24	106.204	212.964	102.268	191.384	293.652	188.936
25	101.308	212.964	97.469	191.384	288.853	185.848
26	105.765	212.174	101.933	190.584	292.517	188.205
27	94.751	200.989	91.317	180.629	271.946	174.970
28	105.765	229.396	101.933	207.780	309.713	199.269
29	106.849	240.173	102.528	218.043	320.571	206.255
30	106.917	240.173	102.560	218.043	320.603	206.276
31	106.917	240.173	102.560	218.043	320.603	206.276
32	106.917	240.173	102.560	218.043	320.603	206.276
33	106.917	240.173	102.560	218.043	320.603	206.276
34	110.112	240.173	105.556	218.043	323.599	208.204
35	111.110	240.173	106.454	218.043	324.497	208.781

TABLE 14 (Continued).—DRY MATTER AND ORGANIC MATTER IN FEED BY 30-DAY PERIODS

Period	Dry matter in grain *Pounds*	Dry matter in hay *Pounds*	Organic matter in grain *Pounds*	Organic matter in hay *Pounds*	Total organic matter *Pounds*	Digestible organic matter *Pounds*
Steer 577 (Cont.)						
36	111.110	240.173	106.454	218.043	324.497	208.781
37	111.110	244.278	106.454	221.518	327.972	211.017
38	111.110	253.795	106.454	229.445	335.900	216.118
39	106.465	253.795	100.597	229.464	330.051	212.355
Steer 575						
1	12.158	69.762	11.512	63.329	74.841	46.618
2	.182	69.026	.175	62.661	62.836	36.646
3	.....	115.261	.....	106.173	106.173	61.920
4	15.236	151.560	14.659	140.360	155.019	90.407
5	26.742	142.210	26.730	129.225	154.955	90.370
6	26.742	150.379	26.730	136.669	162.399	94.711
7	16.314	151.206	15.696	137.426	153.122	89.008
8	.....	142.028	.....	129.078	129.078	75.278
9	.....	147.389	.....	133.779	133.779	78.020
10	.....	139.213	.....	125.591	125.591	73.245
11	.....	137.162	.....	124.453	124.453	72.581
12	.....	138.828	.....	123.158	123 158	71.826
13	.....	138.828	.....	123.158	123.158	71.826
14	.....	149.691	.....	133.024	133.024	77.580
15	.....	152.834	.....	136.004	136.044	79.318
16	24.831	140.477	23.875	124.735	148.610	94.219
17	47.748	178.010	45.892	162.140	208.032	131.892
18	52.087	130.398	50.059	114.848	164.907	104.551
19	52.798	136.154	50.744	120.404	171.148	108.508
20	52.728	136.154	50.668	120.404	171.072	108.460
21	52.728	136.154	50.668	120.404	171.072	108.460
22	52.419	133.109	50.452	117.913	168.365	106.743
23	52.284	137.308	50.357	123.075	173.432	109.956
24	53.047	158.877	51.084	142.777	193.861	122.908
25	52.848	159.736	50.911	143.556	194.467	123.292
26	52.877	159.736	50.961	143.556	194.517	123.324
27	52.877	159.736	50.961	143.556	194.517	123.324
28	52.887	149.840	50.961	144.933	195.894	124.197
29	21.274	160.112	19.105	145.362	164.467	104.272
30	53.460	160.552	51.281	145.762	197.043	124.925
31	53.460	160.552	51.281	145.762	197.043	124.925
32	53.460	160.552	51.281	145.762	197.043	124.925
33	53.460	160.552	51.281	145.762	197.043	124.925
34	54.556	160.552	52.578	145.762	198.340	125.748
35	55.555	160.552	53.227	145.762	198.989	126.159
36	55.555	160.552	53.227	145.762	198.989	126.159
37	55.555	162.844	53.227	147.764	200.991	127.428
38	55.555	169.196	53.227	152.964	206.191	130.725
39	53.233	169.196	50.293	152.964	203.257	128.845
Steer 574						
1	16.086	72.337	15.462	65.667	81.129	51.436
2	8.758	82.829	8.419	75.192	83.611	50.417
3	20.911	118.144	20.100	107.764	127.864	81.066
4	54.842	132.642	53.328	120.860	174.188	110.435
5	41.451	139.717	39.882	127.064	166.946	105.844

TABLE 14 (Continued).—DRY MATTER AND ORGANIC MATTER IN FEED BY 30-DAY PERIODS

Period	Dry matter in grain *Pounds*	Dry matter in hay *Pounds*	Organic matter in grain *Pounds*	Organic matter in hay *Pounds*	Total organic matter *Pounds*	Digestible organic matter *Pounds*
Steer 574 (Cont.)						
6	45.109	150.755	43.389	137.013	180.402	114.375
7	45.686	151.215	43.959	137.431	181.390	115.001
8	10.198	151.215	9.810	137.431	147.241	88.786
9	4.942	152.268	4.762	137.288	142.050	82.844
10	.....	160.321	.....	145.659	145.659	84.948
11	.....	159.116	.....	144.338	144.338	84.178
12	.....	166.605	.....	147.795	147.795	86.194
13	.....	166.605	.....	147.795	147.795	86.194
14	.....	169.588	.....	150.701	150.701	87.889
15	.....	180.783	.....	160.703	160.703	93.722
16	.....	262.436	.....	240.717	240.717	140.386
17	29.015	169.589	27.887	149.359	177.246	110.407
18	52.969	154.553	50.906	136.166	187.072	118.604
19	52.799	158.582	50.736	139.662	190.398	120.712
20	52.730	158.582	50.668	139.662	190.330	120.669
21	52.730	158.582	50.668	139.662	190.330	120.669
22	52.823	162.733	50.856	144.498	195.354	123.954
23	52.284	160.518	50.357	143.869	194.226	123.139
24	53.047	159.736	51.081	143.556	194.637	123.400
25	52.850	159.736	50.913	143.556	194.469	123.293
26	52.877	159.736	50.961	143.556	194.517	123.324
27	52.877	159.736	50.961	143.556	194.517	123.324
28	52.877	185.616	50.961	170.530	221.491	140.425
29	53.402	160.127	51.250	145.377	196.627	124.662
30	53.460	160.571	51.281	145.781	197.062	124.937
31	53.460	160.571	51.281	145.781	197.062	124.937
32	53.460	160.571	51.281	145.781	197.062	124.937
33	53.460	160.571	51.281	145.781	197.062	124.937
34	54.556	160.571	52.578	145.781	198.359	125.760
35	55.556	160.571	52.578	145.781	199.008	126.171
36	55.555	160.571	53.227	145.781	199.008	126.171
37	55.555	162.844	53.227	147.764	200.991	127.428
38	55.555	169.196	53.227	152.964	206.191	130.725
39	53.233	169.196	50.293	152.964	203.257	128.865
Steer 573						
1	12.605	59.714	12.117	54.205	66.322	42.048
2	34.491	94.115	29.300	85.441	114.741	72.746
3	67.653	101.288	65.030	92.233	157.263	105.288
4	94.395	120.418	90.791	109.788	200.579	139.523
5	77.992	134.305	75.042	122.030	197.072	131.940
6	65.162	138.195	62.733	136.822	199.555	128.394
7	55.708	151.216	53.600	137.436	191.036	123.913
8	26.740	151.216	25.728	137.436	163.164	103.446
9	26.458	152.228	25.462	137.248	162.710	103.158
10	13.499	193.531	12.992	177.521	190.513	114.879
11	5.399	185.064	5.196	168.046	173.242	101.035
12	.....	194.340	.....	172.390	172.390	100.538
13	.....	194.340	.....	172.390	172.390	100.538
14	.....	206.712	.....	183.652	183.652	107.106
15	.....	208.516	.....	185.426	185.426	108.140
16	.....	196.976	.....	174.949	174.949	102.030

TABLE 14 (Continued).—DRY MATTER AND ORGANIC MATTER IN FEED BY 30-DAY PERIODS

Period	Dry matter in grain *Pounds*	Dry matter in hay *Pounds*	Organic matter in grain *Pounds*	Organic matter in hay *Pounds*	Total organic matter *Pounds*	Digestible organic matter *Pounds*
Steer 573 (Cont.)						
17	8.437	147.573	8.108	129.973	137.081	82.660
18	26.485	159.023	25.453	140.053	165.506	103.094
19	26.401	195.150	25.374	171.870	197.244	122.863
20	26.365	195.150	25.334	171.870	197.204	122.839
21	36.957	187.201	35.479	164.871	200.350	127.022
22	52.070	186.347	50.103	165.079	215.182	136.425
23	52.285	189.491	50.358	169.844	220.202	139.608
24	53.046	193.005	51.081	173.465	224.536	142.356
25	52.849	185.425	50.912	166.635	217.547	137.925
26	52.877	186.335	50.961	167.455	218.416	138.476
27	52.877	182.819	50.961	164.299	215.260	136.475
28	52.877	178.251	50.961	161.515	212.476	134.710
29	53.447	186.960	51.277	169.782	221.019	140.126
30	53.460	170.905	51.281	169.188	220.469	139.777
31	53.460	171.309	51.281	169.588	220.869	140.031
32	53.460	171.309	51.281	169.588	220.869	140.031
33	53.460	171.309	51.281	169.588	220.869	140.031
34	54.556	171.309	52.578	169.588	222.166	140.853
35	55.555	171.309	53.227	169.588	222.815	141.265
36	55.555	171.309	53.227	169.588	222.815	141.265
37	55.555	189.994	53.227	172.293	225.520	142.980
38	55.555	197.396	53.227	178.458	231.785	146.952
39	53.233	197.396	50.293	178.458	228.751	145.028
Steer 572						
1	14.652	66.795	14.084	60.635	74.719	47.372
2	19.763	48.768	18.997	76.952	95.949	60.832
3	25.738	116.754	24.740	106.329	131.069	83.098
4	26.760	116.404	25.741	115.288	141.029	89.412
5	26.731	135.427	25.729	123.064	148.793	94.335
6	26.741	164.213	25.729	151.683	177.412	112.479
7	14.535	141.583	13.985	128.630	142.665	86.027
8	.....	103.436	.....	90.486	90.486	52.771
9	.445	138.389	.428	124.779	125.207	73.020
10	.....	138.416	.....	125.794	125.794	73.363
11	.....	137.202	.....	124.236	124.236	72.454
12	.....	138.838	.....	123.158	123.158	71.826
13	.....	138.838	.....	123.158	123.158	71.826
14	.....	152.948	.....	135.909	135.909	79.262
15	.....	152.973	.....	135.983	135.983	79.305
16	.....	165.518	.....	147.204	147.204	85.849
17	.....	165.933	.....	146.688	146.688	85.546
18	.....	163.897	.....	145.077	145.077	84.609
19	.....	170.337	.....	150.687	150.687	87.880
20	.....	191.319	.....	169.249	169.249	98.706
21	.....	191.319	.....	169.249	169.249	98.706
22	.....	188.313	.....	167.389	167.389	97.621
23	.....	189.891	.....	164.650	164.650	96.024
24	.....	186.759	.....	167.839	167.839	97.884
25	.....	186.314	.....	167.455	167.455	97.660
26	.....	186.333	.....	167.455	167.455	97.660
27	.....	186.333	.....	167.455	167.455	97.660

TABLE 14 (Continued).—DRY MATTER AND ORGANIC MATTER IN FEED BY 30-DAY PERIODS

Period	Dry matter in grain *Pounsd*	Dry matter in hay *Pounds*	Organic matter in grain *Pounds*	Organic matter in hay *Pounds*	Total organic matter *Pounds*	Digestible organic matter *Pounds*
Steer 572 (Cont.)						
28	.....	177.007	.....	161.031	161.031	93.913
29	.....	199.681	.....	181.281	181.281	105.723
30	.....	214.805	.....	195.015	195.015	113.733
31	.....	225.909	.....	205.099	205.099	119.614
32	.....	240.613	.....	218.433	218.433	127.390
33	.....	240.613	.....	218.433	218.433	127.399
34	.....	212.135	.....	192.595	192.595	112.321
35	.....	240.613	.....	218.433	218.433	127.390
36	.....	240.613	.....	218.433	218.433	127.390
37	.....	244.276	.....	221.518	221.518	129.199
38	.....	253.795	.....	229.446	229.446	133.813
39	.....	253.795	.....	229.446	229.446	133.813
Steer 571						
1	21.901	72.984	21.025	56.247	87.272	55.292
2	29.045	94.772	27.918	86.032	113.950	72.244
3	72.497	96.069	69.688	87.970	157.658	109.666
4	97.728	104.381	94.004	95.171	139.175	96.801
5	94.529	127.521	90.957	117.834	208.791	145.235
6	90.913	123.562	87.472	112.292	199.764	138.955
7	90.913	125.082	87.472	113.682	201.154	139.922
8	90.913	127.725	87.472	112.445	199.917	139.062
9	127.496	95.030	122.696	85.680	108.376	144.946
10	68.385	163.855	65.815	148.935	214.750	136.152
11	62.991	172.918	60.624	156.704	217.328	137.786
12	67.402	180.741	64.838	160.371	225.209	142.783
13	86.448	180.741	83.134	160.371	243.505	154.382
14	67.705	193.738	65.097	172.265	237.362	150.488
15	67.705	194.670	65.097	173.040	238.157	150.979
16	79.906	193.852	76.829	172.117	248.946	160.171
17	80.680	143.604	77.554	126.474	204.028	131.271
18	79.688	159.023	76.581	140.053	216.634	139.382
19	79.204	182.380	76.122	160.620	236.742	152.319
20	79.095	185.009	76.003	162.939	238.942	153.735
21	78.346	185.009	75.236	162.939	238.175	153.241
22	78.263	183.664	67.282	165.090	232.372	149.508
23	78.425	187.272	75.535	167.851	243.386	156.595
24	78.236	183.263	75.394	164.693	240.087	154.472
25	79.228	186.335	76.287	167.455	243.742	156.824
26	79.235	186.335	76.364	167.455	243.819	156.873
27	79.316	189.013	76.442	169.863	246.305	158.473
28	79.316	204.484	76.442	185.209	261.651	168.346
29	80.160	215.246	76.905	195.416	272.321	172.651
30	80.188	213.455	76.920	193.795	270.615	171.633
31	78.852	208.103	75.639	184.533	260.172	164.949
32	80.188	208.103	76.920	184.533	261.453	165.761
33	80.188	208.103	76.920	184.544	261.464	165.768
34	82.282	208.103	78.865	184.544	263.409	167.001
35	83.333	208.103	79.841	184.544	264.385	167.620
36	83.333	208.103	79.841	184.544	264.385	167.620
37	83.333	217.133	79.841	196.902	276.743	175.455
38	83.333	225.595	79.841	203.952	283.793	179.925
39	79.850	225.595	77.434	203.952	281.386	177.399

TABLE 15.—MEASUREMENTS IN CENTIMETERS OF STEERS AT BEGINNING OF SUMMER PERIODS AND END OF WINTER PERIODS

STEER 585

Date	5–22–14	4–17–15	4–12–16	4–7–17	5–2–18	4–27–19	4–21–20
Height at withers	79.5	91.0	103.5	114.5	121.5	124.0	128.0
Height at hips	83.5	93.0	107.0	117.0	126.5	128.0	130.0
Girth of throat	47.0	52.0	64.0	72.0	79.0	78.0	85.0
Depth of chest	32.5	41.0	49.5	55.0	60.0	61.0	62.5
Width of chest	18.0	21.0	23.0	25.0	26.0	29.0	30.0
Width of paunch	20.4	31.0	38.0	42.0	45.5	52.5	54.5
Foreleg elbow to ground	49.0	53.0	63.0	65.0	72.0	72.0	74.0
Point of shoulder to top hip point	60.0	68.0	87.0	94.0	96.0	101.5	109.0
Point of shoulder to ground	60.0	63.0	73.0	77.0	81.5	85.0	92.0
Poll to point of muzzle	26.0	31.0	39.0	44.0	49.0	49.0	49.0
Heart girth	85.0	102.0	121.0	140.0	149.0	153.0	163.0
Paunch girth	85.0	124.0	139.0	157.0	162.0	183.0	192.0
Width of hips	20.0	27.0	34.0	39.0	42.5	43.0	46.0
Width of loin	14.0	18.5	21.5	24.5	25.0	32.5	31.5

STEER 528

Date	6–11–14	4–17–15	4–12–16	4–7–17	5–2–18	4–27–19	4–21–20
Height at withers	81.8	109.0	122.5	130.0	138.5	140.0	143.0
Height at hips	86.3	110.5	126.5	136.0	141.0	143.0	144.5
Girth of throat	54.0	75.0	83.0	94.0	100.0	96.0	100.0
Depth of chest	36.5	53.0	61.5	66.0	73.0	76.0	78.0
Width of chest	20.3	30.0	33.5	40.0	41.0	41.0	43.5
Width of paunch	25.0	41.0	46.0	59.0	61.0	61.0	64.0
Foreleg elbow to ground	50.5	62.0	70.0	75.0	77.0	79.5	80.0
Point of shoulder to top hip point	64.0	87.0	103.0	112.0	114.0	122.0	125.0
Point of shoulder to ground	60.5	72.0	82.0	86.0	91.0	92.0	96.0
Poll to point of muzzle	27.5	38.0	45.0	54.0	56.0	57.0	58.0
Heart girth	95.0	136.0	157.0	175.0	191.0	194.5	201.0
Paunch girth	98.0	144.0	166.0	193.0	206.0	209.0	217.0
Width of hips	22.7	35.0	42.5	49.5	54.5	56.0	59.0
Width of loin	15.3	24.0	27.0	31.5	35.0	38.5	36.0

STEER 579

Date	5–30–14	4–17–15	4–12–16	4–7–17	5–2–18	4–27–19	4–21–20
Height at withers	81.5	104.0	114.5	126.0	135.5	137.5	139.0
Height at hips	75.4	105.0	117.0	128.5	136.5	137.5	140.0
Girth of throat	49.0	64.0	69.0	73.0	83.0	79.0	85.0
Depth of chest	34.5	47.0	54.5	59.5	66.0	67.5	69.0
Width of chest	18.5	23.0	25.5	29.0	32.0	31.5	36.0
Width of paunch	23.0	32.0	40.0	46.0	53.0	49.5	52.0
Foreleg elbow to ground	51.0	63.0	68.0	75.0	79.0	83.0	84.0
Point of shoulder to top hip point	62.0	84.0	99.0	105.0	114.0	121.0	121.0
Point of shoulder to ground	57.0	68.0	78.0	85.0	88.0	92.0	95.0
Poll to point of muzzle	27.5	36.0	43.0	49.0	53.0	52.5	53.0
Heart girth	90.0	120.0	137.0	150.0	168.0	169.0	171.0
Paunch girth	92.0	129.0	142.0	162.0	181.0	181.0	187.0
Width of hips	21.5	30.0	36.0	41.0	47.0	47.0	49.0
Width of loin	14.9	21.0	20.0	23.5	27.0	31.5	31.5

TABLE 15 (Continued).—MEASUREMENTS IN CENTIMETERS OF STEERS AT BEGINNING OF SUMMER PERIODS AND END OF WINTER PERIODS

	STEER 578			STEER 577			STEER 575
Date	5–2–18	4–27–19	4–21–20	5–2–18	4–27–19	4–21–20	5–2–18
Height at withers	107.0	113.0	118.5	113.5	127.0	134.0	100.0
Height at hips	110.0	114.0	120.5	116.75	130.0	136.5	101.5
Girth of throat	64.0	63.0	75.0	73.0	79.0	90.0	60.0
Depth of chest	51.0	53.5	57.5	56.0	64.5	71.5	46.5
Width of chest	24.0	25.0	27.5	28.0	32.5	37.0	21.0
Width of paunch	39.5	46.0	55.0	40.0	52.0	55.0	36.5
Foreleg elbow to ground	64.5	67.0	69.0	70.0	76.5	79.0	60.0
Point of shoulder to top hip point	86.0	91.5	97.0	89.0	106.0	109.0	78.0
Point of shoulder to ground	72.0	76.5	82.0	78.0	88.0	95.0	69.0
Poll to point of muzzle	40.0	42.0	44.0	43.5	50.0	53.0	38.5
Heart girth	128.0	132.0	145.0	141.0	165.0	180.0	119.0
Paunch girth	146.0	162.0	183.0	149.0	179.0	197.0	131.0
Width of hips	34.0	35.5	41.0	34.5	41.5	46.5	27.5
Width of loin	19.0	24.0	26.0	23.5	31.0	35.0	18.0

	STEER 575 (Cont.)		STEER 574			STEER 573	
Date	4–27–19	4–21–20	5–2–18	4–27–19	4–21–20	5–2–18	4–27–19
Height at withers	106.5	114.0	99.0	104.0	111.0	102.0	109.0
Height at hips	109.0	116.5	103.0	107.0	114.5	102.5	109.5
Girth of throat	63.0	63.0	63.0	65.5	72.0	66.0	68.0
Depth of chest	52.0	55.0	49.0	52.5	57.5	52.5	56.5
Width of chest	25.0	27.5	23.5	26.0	25.5	26.0	27.0
Width of paunch	43.0	44.5	37.0	42.0	42.5	39.0	44.5
Foreleg elbow to ground	64.0	70.0	59.0	64.0	68.0	58.0	63.0
Point of shoulder to top hip point	87.0	94.0	80.0	87.0	96.0	77.0	87.0
Point of shoulder to ground	72.0	79.0	66.5	71.0	76.0	68.0	71.0
Poll to point of muzzle	42.0	47.0	39.0	42.5	46.0	40.0	43.0
Heart girth	130.0	142.0	127.0	132.0	145.0	131.0	137.0
Paunch girth	148.0	159.0	135.0	144.0	154.0	141.0	153.0
Width of hips	31.0	36.0	30.0	33.0	36.0	31.0	33.5
Width of loin	22.0	23.0	21.0	22.0	23.0	20.0	25.0

	STEER 573 (Cont.)	STEER 572			STEER 571		
Date	4–21–20	5–2–18	4–27–19	4 21–20	5–2–18	4–27–19	4–21–20
Height at withers	117.0	98.5	105.0	107.5	100.25	114.5	118.5
Height at hips	115.5	99.25	105.4	110.5	104.75	117.5	123.0
Girth of throat	74.0	60.0	62.0	67.0	65.0	75.5	80.0
Depth of chest	61.0	46.0	48.5	51.0	51.0	57.5	62.5
Width of chest	28.5	23.0	24.0	26.0	26.5	31.5	33.0
Width of paunch	47.0	33.5	40.0	47.0	40.0	47.5	50.0
Foreleg elbow to ground	70.0	61.0	62.0	69.0	60.5	69.0	73.0
Point of shoulder to top hip point	90.0	76.0	83.5	89.0	81.0	98.0	101.0
Point of shoulder to ground	77.0	69.0	71.5	76.5	67.5	77.5	81.0
Poll to point of muzzle	46.0	39.0	41.5	44.0	39.0	47.0	49.0
Heart girth	155.0	116.0	124.0	133.0	131.0	149.0	160.0
Paunch girth	166.0	124.0	136.0	158.0	143.0	162.5	175.0
Width of hips	37.0	29.25	31.0	34.0	31.5	38.0	41.0
Width of loin	27.5	18.25	19.5	27.0	19.75	23.0	28.0

TABLE 16.—MEASUREMENTS IN CENTIMETERS OF STEERS AT END OF SUMMER PERIODS AND BEGINNING OF WINTER PERIODS

STEER 585

Date	10–19–14	10–13–15	10–8–16	10–3–17	10–28–18	10–23–19	10–17–20
Height at withers	87.5	94.7	109.0	118.5	122.0	125.0	129.5
Height at hips	92.0	100.0	114.0	122.0	126.0	127.5	130.5
Girth of throat	52.0	53.0	64.0	70.0	73.0	79.0	81.0
Depth of chest	39.5	42.0	50.0	55.0	59.0	61.0	65.5
Width of chest	19.0	19.0	23.0	25.0	25.0	29.5	36.0
Width of paunch	29.5	33.5	40.0	43.5	44.0	52.0	61.0
Foreleg, elbow to ground	52.0	59.0	65.0	69.0	73.0	74.0	74.0
Point of shoulder to top hip point	68.5	73.0	91.0	91.0	99.0	102.0	114.0
Point of shoulder to ground	64.0	64.0	75.0	81.0	82.0	85.5	89.0
Poll to point of muzzle	32.0	33.0	43.0	46.5	48.0	48.5	51.0
Heart girth	99.0	107.0	123.0	139.0	145.0	154.0	169.0
Paunch girth	116.0	129.0	145.0	160.0	166.0	185.0	204.0
Width of hips	26.5	29.7	36.0	38.0	41.0	43.5	47.5
Width of loin	17.0	18.0	20.0	24.0	26.0	30.0	36.0

STEER 528

Date	10–19–14	10–13–15	10–8–16	10–3–17	10–28–18	10–29–19	10–17–20
Height at withers	101.5	115.5	127.0	133.5	139.0	144.0	144.0
Height at hips	103.5	120.5	131.5	138.5	143.0	144.5	143.0
Girth of throat	68.0	73.0	83.0	93.	95.0	99.0	102.0
Depth of chest	46.5	55.5	64.5	71.0	73.5	78.0	79.0
Width of chest	26.0	28.0	35.5	38.5	38.0	41.0	46.0
Width of paunch	39.5	46.7	52.5	55.5	55.0	62.5	65.0
Foreleg, elbow to ground	60.0	70.0	72.0	76.0	81.0	81.5	77.0
Point of shoulder to top hip point	80.0	95.0	104.0	113.0	122.0	124.5	120.0
Point of shoulder to ground	67.0	77.0	87.0	88.0	89.0	94.0	96.0
Poll to point of muzzle	35.0	40.0	50.0	55.5	55.0	57.0	58.0
Heart girth	125.0	144.0	165.0	180.0	189.0	198.5	205.0
Paunch girth	144.0	164.0	183.0	192.0	198.0	214.0	222.0
Width of hips	32.0	39.2	46.5	51.0	54.5	59.0	60.0
Width of loin	20.5	23.0	30.0	31.0	34.5	36.5	39.5

STEER 579

Date	10–19–14	10–13–15	10–8–16	10–3–17	10–28–18	10–29–19	10–17–20
Height at withers	96.0	110.0	121.0	129.5	135.5	138.5	139.5
Height at hips	101.5	114.0	125.0	133.5	137.0	138.5	141.0
Girth of throat	59.0	62.0	69.0	80.0	77.0	78.0	81.5
Depth of chest	42.0	49.5	55.0	61.5	64.0	65.5	68.5
Width of chest	21.0	24.0	29.0	30.5	29.5	31.5	39.0
Width of paunch	31.5	39.0	43.5	45.5	48.0	47.5	52.0
Foreleg, elbow to ground	60.0	67.5	69.0	74.0	82.5	83.0	78.0
Point of shoulder to top hip point	79.0	91.0	100.0	112.0	120.0	119.0	118.0
Point of shoulder to ground	65.0	75.0	85.0	85.0	90.0	90.5	94.5
Poll to point of muzzle	34.0	38.0	46.0	51.5	53.0	52.0	54.0
Heart girth	110.5	124.0	143.0	155.0	163.0	164.0	176.5
Paunch girth	124.0	143.0	155.0	167.0	172.0	176.0	191.0
Width of hips	28.0	32.7	39.0	43.5	47.0	48.0	50.0
Width of loin	20.0	20.5	22.0	25.0	26.5	30.5	31.5

TABLE 16 (Continued).—MEASUREMENTS IN CENTIMETERS OF STEERS AT END OF SUMMER PERIODS AND BEGINNING OF WINTER PERIODS

	STEER 578				STEER 577		
Date	11–3–17	10–28–18	10–29–19	10–17–20	11–3–17	10–28–18	10–29–19
Height at withers	97.0	110.5	113.5	121.0	97.0	122.0	132.0
Height at hips	100.0	111.5	117.0	123.0	102.0	124.5	135.0
Girth of throat	56.0	60.0	66.0	69.0	60.0	73.0	79.0
Depth of chest	43.0	50.5	53.5	59.0	45.0	59.0	67.0
Width of chest	21.5	24.5	24.0	27.5	27.0	30.0	35.5
Width of paunch	40.5	43.0	49.5	51.0	39.0	46.0	52.5
Foreleg, elbow to ground	57.0	64.0	69.0	69.0	61.0	71.0	80.0
Point of shoulder to top hip, point	76.0	90.0	94.0	105.0	74.0	100.0	109.0
Point of shoulder to ground	67.0	75.0	81.0	82.0	68.0	81.0	89.5
Poll to point of muzzle	35.5	41.0	43.0	48.0	35.5	46.0	50.5
Heart girth	111.0	126.0	137.0	151.0	115.0	150.0	171.0
Paunch girth	138.0	154.0	171.0	177.0	137.0	166.0	186.0
Width of hips	29.0	34.0	37.5	41.0	27.5	38.0	44.0
Width of loin	17.5	20.5	24.0	26.5	18.5	25.0	33.0

	STEER 577—(Cont.)	STEER 575				STEER 574	
Date	10–17–20	11 3–17	10–28–18	10–29–19	10–17–20	11–3–17	10–28–18
Height at withers	136.5	91.5	102.5	111.0	118.5	91.0	102.0
Heirht at hips	138.0	95.0	104.5	115.5	119.0	95.5	105.0
Girth of throat	89.0	55.0	57.0	70.0	72.0	58.5	57.0
Depth of chest	73.0	42.0	47.5	54.0	57.5	44.5	49.5
Width of chest	40.0	21.0	22.0	26.0	29.5	23.0	24.0
Width of paunch	56.0	36.0	42.5	47.5	49.5	39.0	40.0
Foreleg, elbow to ground	81.5	57.0	62.0	69.0	70.0	56.0	60.0
Point of shoulder to top hip point	122.0	72.0	85.0	91.5	100.0	72.0	83.0
Point of shoulder to ground	93.0	65.0	69.0	78.5	79.0	63.0	67.0
Poll to point of muzzle	56.0	34.0	40.0	45.0	50.0	36.0	41.0
Heart girth	181.0	107.0	119.0	137.0	146.0	113.0	128.0
Paunch girth	201.0	129.0	148.0	165.0	169.0	132.0	148.0
Width of hips	48.0	24.0	28.0	33.0	37.5	27.0	30.5
Width of loin	35.5	16.5	18.5	23.0	26.5	17.0	22.0

	STEER 574—(Cont.)		STEER 573				STEER 572
Date	10–29–19	10–17–20	11–3–17	10–28–18	10–29–19	10–17–20	11–3–17
Height at withers	108.5	114.0	92.0	106.5	114.5	119.0	89.5
Height at hips	112.0	116.5	94.0	107.0	115.0	118.5	93.0
Girth of throat	69.0	70.0	58.0	64.0	74.0	75.0	55.0
Depth of chest	56.0	60.5	44.5	51.5	58.0	68.0	40.5
Width of chest	29.0	32.5	24.5	25.0	30.0	30.5	22.5
Width of paunch	46.5	47.0	39.0	43.0	48.5	50.5	36.0
Foreleg, elbow to ground	66.0	65.0	55.0	62.0	68.0	66.5	56.0
Point of shoulder to top hip point	92.5	100.0	71.0	83.0	94.0	101.0	70.0
Point of shoulder to ground	75.0	78.0	63.0	72.0	75.5	79.0	62.0
Poll to point of muzzle	45.5	49.0	35.0	41.0	44.5	49.0	34.0
Heart girth	145.0	150.0	116.0	133.0	149.0	159.0	116.0
Paunch girth	160.0	165.0	138.0	150.0	167.0	175.0	126.0
Width of hips	35.0	38.0	28.0	31.5	36.0	39.0	25.0
Width of loin	25.0	27.5	19.0	21.0	28.0	27.5	16.5

TABLE 16 (Continued).—MEASUREMENTS IN CENTIMETERS OF STEERS AT END OF SUMMER PERIODS AND BEGINNING WINTER PERIODS

STEER 572—(Cont.)				STEER 571			
Date	10–28–18	10–29–19	10–17–20	11–3–17	10 28–18	10–29–19	10–17–20
Height at withers	102.25	107.5	115.5	83.5	107.0	116.0	120.0
Height at hips	102.25	109.0	113.0	88.5	111.0	120.5	123.5
Girth of throat	58.0	65.0	65.0	54.0	68.0	72.0	78.0
Depth of chest	46.5	50.0	54.5	39.0	53.0	59.5	63.5
Width of chest	23.5	24.0	29.0	20.0	29.0	33.5	34.5
Width of paunch	39.5	41.0	49.0	35.0	48.0	50.0	52.5
Foreleg, elbow to ground	63.0	67.0	67.0	53.0	66.0	71.5	72.0
Point of shoulder to top hip point	82.0	85.5	98.0	65.0	88.0	101.0	110.0
Point of shoulder to ground	67.0	76.0	77.0	57.0	70.0	81.5	80.0
Poll to point of muzzle	39.0	42.0	46.0	32.0	42.0	49.0	51.0
Heart girth	120.0	129.0	137.0	100.0	140.0	156.0	165.0
Paunch girth	138.0	145.0	163.0	125.0	163.0	167.0	182.0
Width of hips	30.0	32.0	35.0	24.0	35.0	39.5	43.0
Width of loin	18.5	23.0	26.5	16.0	23.0	29.0	28.5

TABLE 17.—MEASUREMENTS* IN CENTIMETERS OF CONTROL ANIMALS AT TIME OF SLAUGHTER

Steer No.	554	552	523	526	512	531	525	509
Height at withers	90.5	96.5	128.8	130.0	153.0	114.75	124.8	140.0
Height at hips	96.8	98.0	130.0	140.5	150.5	115.5	126.8	139.0
Girth of throat	55.0	60.0	87.0	94.0	100.0	72.0	80.0	90.5
Depth of chest	38.5	44.0	66.0	71.5	80.0	54.5	62.0	67.0
Width of chest	22.3	25.0	36.0	43.0	44.5	26.5	30.5	40.5
Width of Paunch	25.6	33.3	62.0	57.0	62.0	42.0	54.0	53.0
Foreleg, elbow to ground	60.0	61.2	76.5	85.0	88.0	72.5	73.8	84.5
Point of shoulder to top hip point	70.5	75.0	112.0	124.0	127.0	94.0	105.0	116.0
Point of shoulder to ground	67.0	70.0	88.0	94.0	101.0	88.5	85.0	98.5
Poll to point of muzzle	31.5	35.0	52.5	54.0	55.0	43.0	51.0	52.0
Heart girth	101.0	114.0	175.0	197.0	210.0	146.0	160.0	186.0
Paunch girth	103.0	125.0	210.0	212.0	220.0	160.0	189.0	204.0
Width of hips	23.1	27.0	46.0	53.0	56.0	35.5	40.5	48.5
Width of loin	17.0	21.7	37.0	41.0	43.5	27.5	31.5	41.0

*From unpublished data furnished by C. R. Moulton, department agricultural chemistry, Missouri Agricultural Experiment Station.

TABLE 18.—COMPOSITION OF CONTROL ANIMALS

Steer	Age days	Weight pounds	Composition of body		
			Dry matter per cent	Protein per cent	Fat per cent
554	90	196.0	32.836	20.038	7.395
552	160	256.2	35.928	19.469	10.555
523	798	864.2	39.479	19.219	15.134
526	1217	1088.2	44.552	18.813	20.435
512	1454	1250.4	48.001	18.094	24.299
531	588	479.6	37.227	20.263	10.355
525	800	694.6	37.338	20.031	11.787
509	1363	1004.2	42.079	20.181	16.232

From unpublished data furnished by C. R. Moulton, department agricultural chemistry Missouri Agricultural Experiment Station.

TABLE 19.—ENERGY VALUE OF GAINS, CALCULATED FOR SUMMER PERIODS

Period† Steer	1 Therms	2 Therms	3 Therms	4 Therms	5 Therms	6 Therms	7 Therms
Group I							
528	.95575	1.0918	1.2279	1.7136	2.1993	2.500	3.000
577	1.0918	1.2279	1.7136	.....	.....	.....	.....
571	1.0918	1.2279	1.7136	.....	.....	.....	.....
Group II							
579	.95575	1.0583	1.0583	1.1608	1.4104	1.5352	1.66
578	1.0583	1.0583	1.1608	.....	.....	.....	.....
573	1.0583	1.0583	1.1608	.....	.....	.....	.....
Group III							
585	.8343	.9445	.9445	1.0548	1.1013	1.1479	1.649
575	.9445	1.0548	1.1013	.....	.....	.....	.....
574	.9445	1.0548	1.1013	.....	.....	.....	.....
572	.9445	1.0548	1.1013	.....	.....	.....	.....

Table 18 shows the ages, weights, and percentage composition of live weight of the control animals used in this study.

†These same values apply also to the winter periods of the seven younger steers. In the case of the three older animals, Nos. 528, 579, and 585, the first winter period corresponds to the second summer period and so on, thus making the sixth winter period correspond to the seventh summer period.

From these data the composition of the gains was estimated for all periods except period seven of 528. No control animal to fit this period could be found. The value of three therms per pound gain was used in this case. This value was assumed on the basis of Armsby's calculation (3f) of the energy value of gains from Lawes and Gilbert's analyses on four-year-old fattening cattle.

Table 19 shows the estimated energy value of the gains by periods for all the steers.

Table 20 shows distribution of the control animals. Check animals were first fitted to the old steer in each group; then the young animals were compared with the old animal in their respective groups rather than with check animals direct.

TABLE 20.—DISTRIBUTION OF CONTROL ANIMALS.

Period	1	2	3	4	5	6	7
Steer 528	552	Inter-polate	523	Inter-polate	526	512	.....
577 571	Period 2 of 528	523	Period 4 of 528	.....	.....	.....	.....
579	552	Inter-polate	Inter-polate	525	Inter-polate	Inter-polate	509
578 573	Period 2 of 579	Period 3 of 579	525	.....	.....	.....	.....
585	554	Inter-polate	Inter-polate	531	Inter-polate	525	523 .....
575 574 572	Period 3 of 585	531	Period 5 of 585				

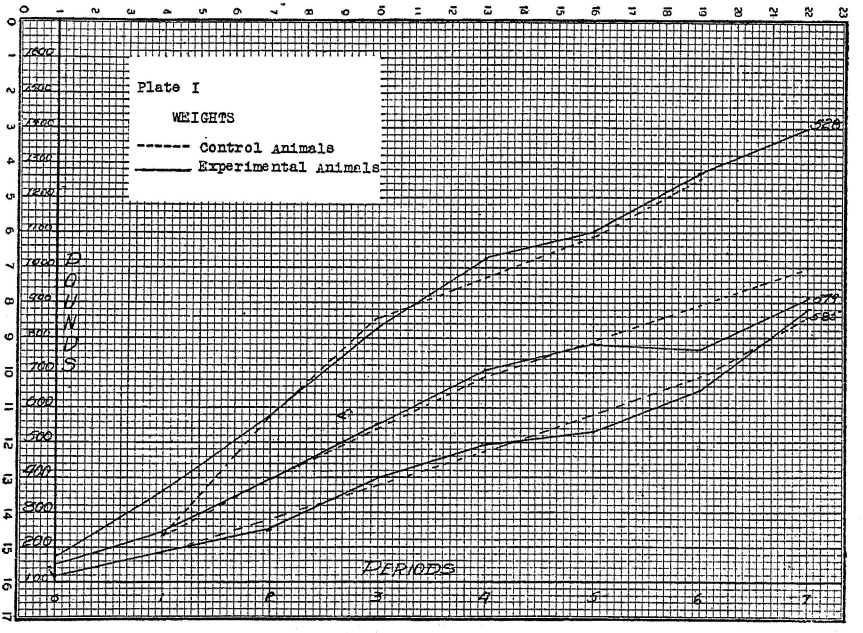

Fig. 1.—Weights—Comparison of control animals and experimental animals.

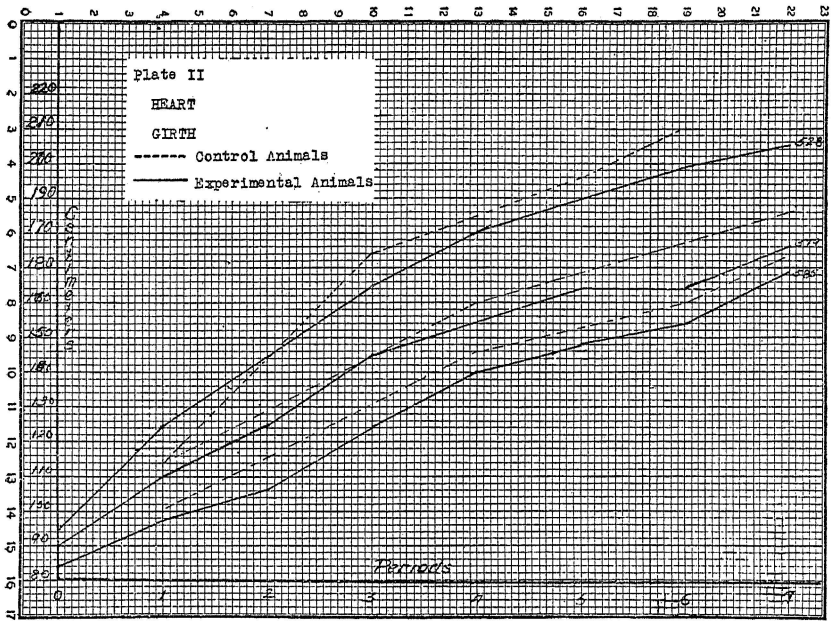

Fig. 2.—Heart Girth—Comparison of control animals and experimental animals.

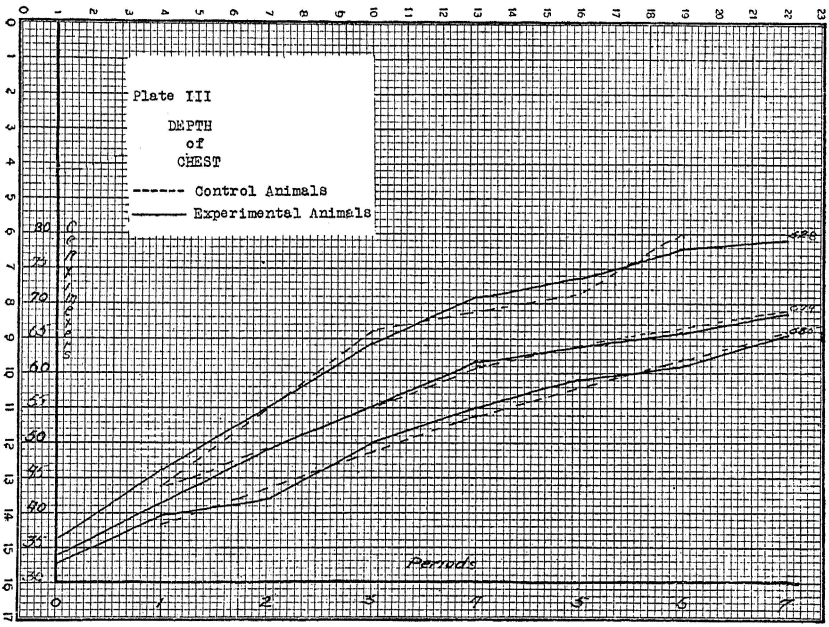

Fig. 3.—Depth of Chest—Comparison of control animals and experimental animals.

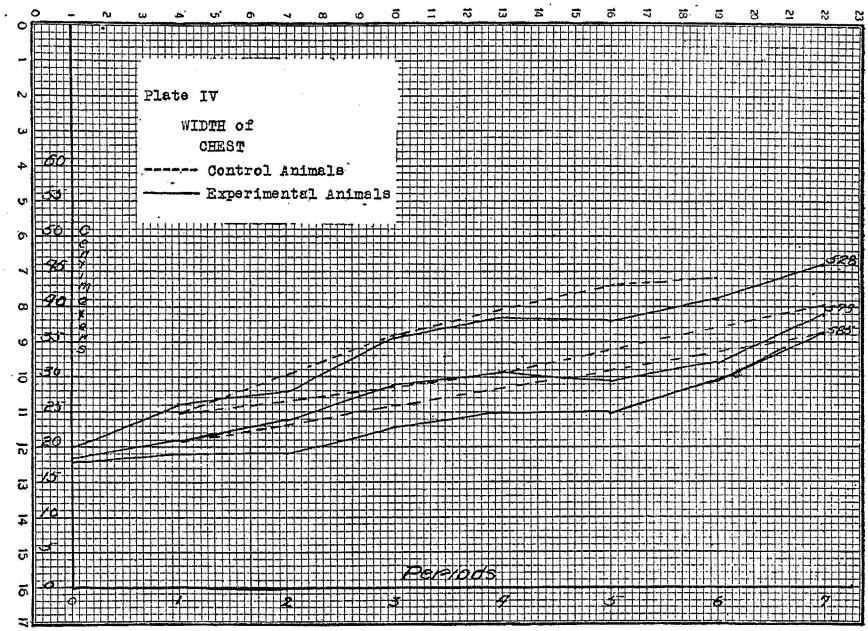

Fig. 4.—Width of Chest—Comparison of control animals and experimental animals.

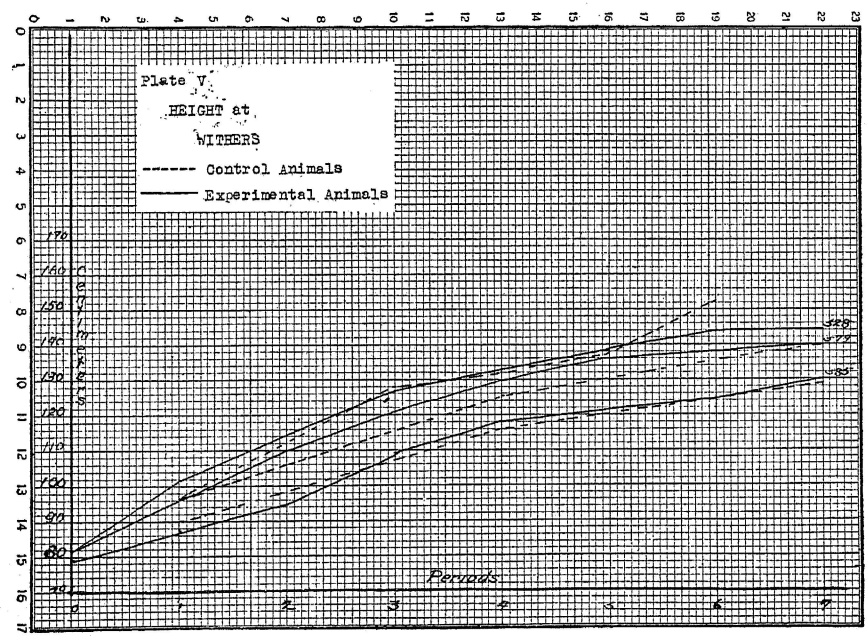

Fig. 5.—Height at Withers—Comparison of control animals and experimental animals.