Table 35 (Continued)

Av. daily gain per steer, lbs.	1.96±0.08	2.46±0.14	2.38±0.06
Daily ration per steer, lbs.:			
Ground milo grain	15.7	16.7	17.3
Soybean oil meal	1.0	1.0	1.0
Alfalfa hay	5.6	5.8	5.9
Salt	0.06	0.03	0.06
Bonemeal-salt[7]	0.02	0.02	0.02
Feed per cwt. gain, lbs.:			
Ground milo grain	801.0	678.9	726.9
Soybean oil meal	51.0	40.6	42.0
Alfalfa hay	285.7	235.8	247.9
Salt	3.1	1.2	3.1
Bonemeal-salt	1.0	0.8	0.8
Feed cost per cwt. gain, $	25.43	21.38	22.79

Phase 2—Fattening—May 21, 1957, to August 13, 1957—84 days (by treatment).

Treatment	Control	Synovex implant	Synovex reimplant	Stilbestrol implant	Stilbestrol reimplant
Lot number	1	2	2	3	3
Number of steers	10	5	5	5	5
Av. initial wt. per steer, lbs.	726.5	730.0	765.0	755.0	749.0
Av. final wt. per steer, lbs.	891.5	920.0	989.0	952.0	952.0
Av. total gain per steer lbs.	165.0	190.0	224.0	197.0	203.0
Av. daily gain per steer, lbs.	1.96 ±0.08	2.26 ±0.20	2.67 ±0.18	2.34 ±0.10	2.42 ±0.08
Carcass grades, USDA:					
Av. choice					1
Low choice	4	1	1	1	1
High good	1	1	1	2	..
Av. good	2	1	1	2	..
Low good	3	2	2	..	2
High standard	..	..	..	..	1
Av. USDA grade[10]	11.6	11.2	11.2	11.8	11.2
Av. marbling score[11]	7.8	8.0	8.0	7.6	8.0
Av. fat thickness score[12]	3.8	4.2	3.4	3.8	4.6
Av. rib eye size score[13]	4.7	4.6	4.8	4.8	4.2
Av. firmness score[14]	4.9	4.8	4.8	4.2	5.0

Summary of Phases 1 and 2—December 4, 1956, to August 13, 1957—252 days.

Av. total gain per steer, lbs.	447.5	510.0	507.5	
Av. daily gain per steer, lbs.	1.78±0.04	2.02±0.06	2.01±0.08	

7. Salt fed free choice and a mixture of 2 bonemeal plus 1 salt, also fed free choice in fattening period.

10. Average grade determined as follows: high choice, 15; average choice, 14; low choice, 13; high good, 12; average good, 11; low good, 10; high standard, 9.

11. Visual marbling score determined as follows: moderate, 5; modest, 6; small amount, 7; slight amount, 8.

12. Visual fat covering at 12th rib: moderate, 3; modest, 4; slightly thin, 5.

13. Visual rib eye score: moderately large, 3; modestly large, 4; slightly small, 5.

14. Firmness of rib eye: firm, 2; moderately firm, 3; modestly firm, 4; slightly firm, 5.

Table 35 (Continued)

Av. total feed cost per steer (including implants), $	86.28	91.01	92.39
Av. initial cost per steer[8]	102.12	102.23	102.23
Initial cost plus feed cost	188.40	193.24	194.62
Selling price per cwt.[9]	23.48	23.12	22.76
Av. value per steer	209.32	220.68	216.68
Av. return per steer	20.92	27.44	22.06
Av. dressing percent	59.64	59.70	58.11
Carcass grades, USDA:			
Av. choice	..	..	1
Low choice	4	2	2
High good	1	2	2
Av. good	2	2	2
Low good	3	4	2
High standard	..	..	1
Av. USDA grade[10]	11.6	11.2	11.5
Av. marbling score[11]	7.8	8.0	7.8
Av. fat thickness score[12]	3.8	3.8	4.2
Av. rib eye size score[13]	4.7	4.7	4.5
Av. firmness score[14]	4.9	4.8	4.6

8. Initial cost per steer was $23.00 per cwt.

9. Based on carcass grades and carcass weights with U.S. choice at 40c and U.S. good carcasses at 37c per pound.

10. Average grade determined as follows: high choice, 15; average choice, 14; low choice, 13; high good, 12; average good, 11; low good, 10; high standard, 9.

11. Visual marbling score determined as follows: moderate, 5; modest, 6; small amount, 7; slight amount, 8.

12. Visual fat covering at 12th rib: moderate, 3; modest, 4; slightly thin, 5.

13. Visual rib eye score: moderately large, 3; modestly large, 4; slightly small, 5.

14. Firmness of rib eye: firm, 2; moderately firm, 3; modestly firm, 4; slightly firm, 5.

Nutritive Value of Forages as Affected by Soil and Climatic Differences; Limestone Pasture vs. Sandstone Pasture (Project 430).

B. A. Koch, E. F. Smith, D. Richardson and R. F. Cox

This report is a summary of the results obtained in the first trial of a study designed to determine differences in the nutritive value, for beef cattle, of forages grown on limestone or sandstone soils. Preliminary results were reported in detail in Kansas Circular 349.

In a study of this sort there are many variables which cannot be completely controlled or eliminated. It is virtually impossible to select pastures and meadows that are alike in every detail. Pastures within a few miles of each other receive differing amounts of moisture in a given period of time. Previous treatment, type of forage, yield of forage; all of these and many other variables affect the results obtained. Therefore, several trials extending over a number of years must be carried out before definite conclusions can be made.

Experimental Procedure

Spayed Hereford heifers were used in this first trial extending over a period of 18 months. Throughout the trial animals in each group received roughage grown either on sandstone or limestone soil. Detailed procedures for the first three phases of the study were reportd in Circular 349 from this station.

During a three-week period beginning on March 9, 1957, the heifers were gradually brought to full feed on a fattening ration. The heifers were hand-fed daily all the feed they would eat throughout the fattening period. Those animals receiving supplemental phosphorus before the fattening period began continued to receive it throughout the fattening period. Rations fed and results obtained are listed in detail in Tables 36 and 37.

Observations

At the end of the overall study those cattle receiving forage grown on limestone soil had made an average total gain that was 53 pounds greater than that made by similar cattle receiving forage grown on sandstone soil. The difference in total gain was 74 pounds at the beginning of the fattening period. All of this extra gain in favor of those cattle consuming forage grown on limestone soil occurred during the two winter phases of the study.

Statistical treatment of the gain data indicated that the difference in the average final weight of the two groups of cattle was a real difference. Likewise the differences in gains made during the two wintering periods and during the fattening period were real differences.

It should be noted that the cattle on sandstone forage actually gained somewhat more than those on limestone forage during the grazing season. And during the fattening period they gained considerably more than those on limestone forage. The addition of 4 gms. per day of supplemental phosphorus to the diet of half the animals in each group during the latter part of the study did not result in any definite change in weight gains.

Blood levels of calcium and phosphorus were followed throughout the study. Average blood calcium levels were smilar for both groups throughout the study. However, there was considerable variation within groups. Blood inorganic phosphate levels varied considerably within groups of animals. Also at the end of the second winter period the animals receiving sandstone forage and no supplemental phosphorus showed a reduced amount of inorganic blood phosphates. It should be noted that all groups showed an increase in blood phosphorus content during the fattening period.

At slaughter the right front metacarpal bone (cannon bone) was removed from one half the carcasses in each group and submitted to various tests. Results are reported in Table 38 and indicate no apparent differences in composition, length or breaking strength of bones from animals in the various groups.

Results of the overall study indicate only that those animals receiving forage from limestone soil did gain at a faster rate during the total time involved. All of this increased gain apparently can be credited to the wintering periods. Present data do not indicate the reason for the increased gain of the animals receiving limestone forage. It is possible that a difference in net energy available to the animals during the wintering periods caused the differences in gains. However, all animals consumed about the same average amount of feed, and chemical analyses showed no great chemical differences in feeds fed. Under conditions of the study supplemental phosphorus did not improve the performance of the animals. No other dietary additives were checked in this study.

Table 36

Average Total Weight Gain of Spayed Heifers Eating Forage Grown on Limestone and Sandstone Soils During the Complete Study.

Soil type	Limestone	Sandstone
Number of animals	19	20
Av. initial wt., lbs.	553	558
Phase 1—December 5, 1955, to April 15, 1956—131 days.		
	Pasture	Pasture
Av. total gain, lbs.	63±5.7[1]	6±5.1[1]
Phase 2—April 15, 1956, to October 8, 1956—176 days.		
	Pasture	Pasture
Av. total gain, lbs.	180±5.6	193±6.2
Phase 3—October 8, 1956, to March 8, 1957—151 days.		
	Dry-lot	Dry-lot
(Wintering ration)		
Av. total gain, lbs.	149±8.4	114±8.4

1. Standard error of mean.

Table 36 (Continued)

Phase 4—March 8, 1956, to June 8, 1957—92 days.		
	Dry-lot	Dry-lot
(Fattening ration)		
Av. total gain, lbs.	128±6.1	149±6.9
Summary—December 5, 1955, to June 8, 1957.		
Av. total gain, lbs.	520±13.6	462±17.7
Av. final wt., lbs.	1073	1020

Table 37

Limestone Prairie Hay versus Sandstone Prairie Hay in the Fattening Ration of Spayed Heifers Previously Wintered and Summered on Forage Produced Either on Limestone or Sandstone Soil.

March 8, 1957, to June 8, 1957—92 days.

Soil type	Limestone		Sandstone	
Treatment	Control	+ H_3PO_4	Control	+ H_3PO_4
Number of heifers	9	10	10	10
Av. initial wt., lbs.	935	948	866	875
Av. total gain, lbs.	115	133	160	144
Av. daily gain, lbs.	1.25 ±0.08[4]	1.44 ±0.10[4]	1.74 ±0.08[4]	1.57 ±0.12[4]
Av. final wt., lbs.	1050	1081	1026	1019
Av. daily ration:				
Sorghum grain, lbs.	14.7	15.7	15.7	15.7
Prairie hay, lbs.	9.5	10.0	11.0	11.0
Soybean meal, lbs.	1.5	1.5	1.5	1.5
Added phosphorus, gms.[1]	0	4	0	4
Av. feed per cwt. gain:				
Sorghum grain, lbs.	1176.0	1083.0	910.6	1004.8
Prairie hay, lbs.	760.0	690.0	638.0	704.0
Soybean meal, lbs.	120.0	103.5	87.0	96.0
Phosphorus, gms.	0	276	0	256
Av. carcass wt., lbs.	639	655	588	587
Av. dressing percent[2]	61	60	57	58
Av. carcass grade[3]	13.2	13.0	11.0	11.2

1. Phosphoric acid mixed in the soybean meal.
2. Dressing percent calculated by dividing average hot carcass wt. by average final wt. taken in Manhattan.
3. Carcass grade determined as follows: high choice, 15; average choice, 14; low choice, 13; high good, 12; average good, 11; low good, 10; high standard, 9; average standard, 8; low standard, 7; high commercial, 6.
4. Standard error of mean.

Table 38

Additional Data Collected During the Study of Limestone versus Sandstone Forage for Spayed Beef Heifers.

Soil type	Limestone		Sandstone	
Treatment	Control	+ H_3PO_4	Control	+ H_3PO_4
Bone analyses				
Right front metacarpal (cannon bone)				
Av. percent ash (moisture free, fat free)	68.73	68.99	68.18	68.84
Av. length, cms.	19.68	19.52	19.76	19.69
Av. breaking-strength, lbs.:[1]				
First crack	2264	2192	2754	2168
Shattered	3346	4278	4762	3768

1. Determined in the laboratory of the Department of Applied Mechanics with the assistance of M. E. Raville and M. W. Davis.

Table 38 (Continued)

Blood analyses:				
Inorganic phosphate, mg. %				
3-14-56	7.68	....	8.00	....
	±0.12[2]	....	±0.40[2]	....
11-13-56	7.58	....	6.98	....
	±0.28	....	±0.21	....
3-13-57	7.65	7.82	6.30	7.40
	±0.27	±0.32	±0.42	±0.39
5-29-57	10.30	11.02	9.51	9.26
	±0.80	±0.95	±0.94	±1.50
Calcium, mg. %				
3-14-56	11.44	....	11.26	....
	±0.16	....	±0.10	....
11-13-56	11.31	....	11.37	....
	±0.27	....	±0.20	....
3-13-57	11.77	11.12	11.45	11.33
	±0.19	±0.15	±0.20	±0.16
5-29-57	10.60	10.20	10.66	11.31
	±0.08	±0.25	±0.67	±0.67

2. Standard error of mean.

The Use of Tranquilizer Compounds[1] [2] in Wintering Rations for Steers (Project A-597).

B. A. Koch, E. F. Smith, D. Richardson and M. M. McCartor

Recent experimental work with chemical tranquilizers has indicated that these substances may be of value in the fattening ration of beef cattle under certain conditions. Theoretically at least, the chemical tranquilizers should calm the animals and thus reduce the amount of energy lost due to nervousness and unnecessary muscular activity. It is also possible that they have some other effect upon the animal which leads to increased weight gains and improved feed efficiency. The trial reported herein was designed to determine whether or not tranquilizer compounds will improve the performance of beef cattle on a wintering ration.

Experimental Procedure

Forty-eight steer calves weighing approximately 550 pounds each were divided into three groups (one group of 10, one group of 18 and one group of 20) at the beginning of the wintering period. Pre-selected animals will be removed from each of the larger groups after the wintering period for a pasture study. Ten calves in each group will be continued through a fattening study.

Two tranquilizer compounds, Paxital and Tran-Q, are being compared in the study. The compounds are mixed with the soybean oil meal portion of the rations fed.

The daily rations fed per animal were as follows: sorghum grain, 4 pounds; soybean oil meal, 1 pound; sorghum silage, 15 pounds; prairie hay, free-choice. All of the animals had access to a mixture of bonemeal and salt. They also had access to salt alone. Water was available at all times from heated automatic waterers. The cattle were in outdoor lots with no access to shelter.

Observations

1. At no time during the wintering period did any of the animals receiving either tranquilizer show any visible evidence of sedation or calming. This was also true in a very limited test conducted earlier in which animals received much higher levels of tranquilizer in their diet.

1. Paxital is the brand name of a tranquilizer furnished by S. B. Penick and Co. of New York.

2. Tran-Q is the brand name of a tranquilizer furnished by Chas. Pfizer and Co., Inc., Terre Haute, Ind.

2. Feeding the tranquilizers did not increase daily gain or improve feed efficiency significantly under the conditions of this study.

3. No undesirable effects of any kind were noted in any of the animals during the test period.

Table 39

The Use of Tranquilizer Compounds in Wintering-Type Rations for Steer Calves.

December 5, 1957, to March 25, 1958—110 days.

Treatment	Control	Paxital	Tran-Q
Lot number	22	18	19
Number steers	20	10	18
Av. initial wt., lbs.	548	544	559
Av. final wt., lbs.	708	719	718
Av. total gain, lbs.	160	175	159
Av. daily gain, lbs.	1.46±0.07[4]	1.59±0.08[4]	1.45±0.06[4]
Av. daily ration:			
Ground sorghum grain, lbs.	4.0	4.0	4.0
Soybean oil meal, lbs.	1.0	1.0	1.0
Prairie hay, lbs.	6.9	6.8	7.8
Sorghum silage, lbs.	13.1	13.1	12.4
Paxital, mgs.[1] [2]		75	
Tran-Q, mgs.[1] [3]			1.5
Feed per cwt. gain:			
Ground sorghum grain, lbs.	274.0	251.60	276.00
Soybean oil meal, lbs.	68.50	62.90	69.00
Sorghum silage, lbs.	897.35	823.99	855.60
Prairie hay, lbs.	472.65	427.72	538.20
Feed cost per cwt. gain, $[5]	14.22	13.01	14.59

1. Mixed in the soybean oil meal.
2. Paxital cost estimated to be about ..... per gm. by S. B. Penick and Co.
3. Tran-Q cost estimated to be about 0.80c per gm. by Chas. Pfizer and Co.
4. Standard error of mean.
5. Not including tranquilizer cost.

Relationship Among Live and Carcass Characteristics of Slaughter Steers.

John D. Weseli, D. L. Good and L. A. Holland

One of the major tools needed for a more accurate live animal evaluation is an objective method of determining the amount of muscle in a beef steer. We can come close to estimating dressing percentage and grade but these factors are not good indicators of the amount of red meat or "edible portion" that is in the carcass. Many prime cattle have less utility or true value than choice cattle because of excess fat and/or lack of muscle.

From the standpoint of the consumer as well as that of the packer, the most desirable carcass is one that has a large proportion of high-quality lean meat. After a steer is fat enough to attain a desired grade, additional finish is objectionable because the extra fat must be trimmed off. This extra fat is a problem to the processor and it is uneconomical for the feeder to produce overfinished cattle. The important problem is to be able to determine when the animal is correctly finished and to predict how much red meat he has under his hide. An experienced stockman, by handling and careful visual appraisal of an animal, can make a fairly good estimate of muscling. A more objective method, however, is needed to aid in the selection of superior market animals and breeding stock, particularly of herd sires, since the heritability of muscling in beef cattle is high.

This is a report of an exploratory study to find a possible live-animal