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Winter Pasture Investigations with Beef Calves

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I am submitting herewith a thesis written by Robert Moorman Jr. entitled "Winter Pasture Investigations with Beef Calves." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Animal Science.

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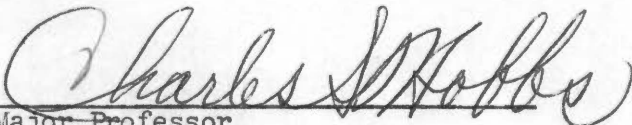
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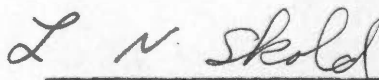
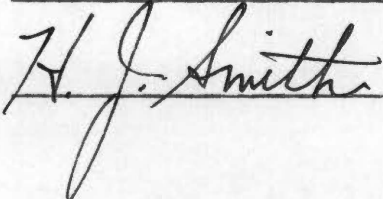
July 5, 1955

To the Graduate Council:


I am submitting herewith a thesis written by Robert Moorman, Jr. entitled "Winter Pasture Investigations with Beef Calves." I recommend that it be accepted for nine quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Animal Husbandry.


Major Professor

We have read this thesis
and recommend its acceptance:

Accepted for the Council:


Dean of the Graduate School

WINTER PASTURE INVESTIGATIONS WITH BEEF CALVES

A THESIS

Submitted to
The Graduate Council
of
The University of Tennessee
in
Partial Fulfillment of the Requirements
for the degree of
Master of Science

by
Robert Moorman, Jr.
August 1955

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Robert Moorman, Jr.

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CHAPTER I

INTRODUCTION AND PURPOSE

Winter pastures have and are being advocated and produced throughout the Southeast for livestock production, soil improvement and soil conservation. Feeding tests using winter pasture as part or all of the wintering ration for cattle have been conducted primarily in states south of Tennessee. These states differ from Tennessee in soils, climatic conditions and pasture species used.

If winter pastures are to be produced in Tennessee, information is needed as to their place in livestock production, soil improvement and soil conservation. Some of the questions such as seeding rate and date, fertilization, kinds and varieties of crops, soil conservation and soil improvement have been at least partially answered.

In Tennessee the value of winter pasture in the wintering ration for producing slaughter and stocker cattle was unknown. No information was available on the type carcasses that could be produced by a ration involving winter pasture. Other problems which needed investigation were: cost of producing winter pasture, soil types best suited for winter pasture, size and kind of animals to use, rate of grazing and the effects of varying amounts of moisture and temperature.

Because of the state's wide soil and climatic variation, winter pasture projects were started at four locations of University of Tennessee Agricultural Experiment Stations; namely, Tobacco Experiment Station, Greeneville, Main Experiment Station, Knoxville, Middle

Tennessee Experiment Station, Columbia and West Tennessee Experiment Station, Jackson. Projects were started at these stations in the fall of 1949 with the following objectives:

1. To study the use of winter pasture for wintering and finishing calves.
2. To compare the effect of different rations, when fed with winter pasture, to produce slaughter and stocker cattle.
3. To study the reception at Tennessee markets of yearlings carried to a good to choice finish largely on pasture and roughage.
4. To evaluate the market reception and qualities of carcasses from calves grazed on winter pasture as compared to carcasses from calves fed on silage, hay and concentrates.

CHAPTER II

REVIEW OF LITERATURE

Tests with winter pasture as all or part of the ration have been conducted in several states. The majority of the tests conducted in other states evaluated winter pasture only from the standpoint of species and mixtures. Very little has been done in comparing the results of winter pasture rations with dry-lot rations of silage, concentrates and hay.

Means, Coleman and Bennett (1946) reported on winter grazing tests starting with 10-month-old calves weighing approximately 485 pounds. These calves were put on winter pasture from January 23 to May 15.

The three pastures tested were oats, oats and wild winter peas and oats and crimson clover. In the 112 day period all calves gained over 1.50 pounds per head per day. The oats and crimson clover produced the greatest gain, 298 pounds per acre, as compared to 206 pounds per acre produced by oats and wild winter peas. Cattle on all of these tests made a greater net return than if they had been sold at weaning time.

Means and Bennett (1947) reporting on the second year of the tests said, "The steers in all six plots made satisfactory gains so long as there was an abundance of grazing available." The steers on these tests gained from 1.12 to 1.61 pounds per head per day. As in the case of 1946, cattle from all lots made a greater net return than if they had been sold at weaning. For continuous winter grazing it was recommended that the pastures be stocked at approximately 500 pounds of cattle per acre.

Gill (1947) reported on cooperative studies on two farms. On each farm one group of 9-month-old steers was grazed on oats and crimson clover and the other group was fed in the dry-lot with silage, hay and 6 pounds of concentrates. In both instances the cattle on winter pasture gained more pounds and had a higher net return than the cattle on silage, hay and concentrates. In the 1948 report on the same farms, according to Gill (1948), grazing only until March 1 to permit harvesting a grain crop was more profitable than continuous grazing. During this year no cattle were tested on the dry-lot ration. The net returns per acre ranged from \$49.75 to \$61.75.

In an experiment at McNeill, Mississippi, Gill (1948) reported steer calves on oat pasture gained an average of 2.5 pounds per head per day for 91 days, December 1 to March 1. The cattle were sold and, then, the oats were allowed to mature for harvesting. In a comparative lot, cattle were grazed from December 1 to May 13 for a total of 166 days. These steers gained 1.91 pounds per day. The oats that were grazed continuously returned \$16.00 per acre more than the oats that were grazed and saved for a crop. As a result of these tests Gill recommended 300 to 400 pounds of live animal per acre as the desirable stocking rate for continuous grazing.

Coleman (1948), in comparing dry-lot feeding to winter pasture, reported a net profit of \$66.73 per head for steers fed in the dry-lot and \$78.65 per head for steers grazing winter pasture. There was no mention of the daily ration of the steers in the dry-lot but the dry-lot

steers gained 2.49 pounds per day as compared to 1.79 pounds per day for the steers on winter pasture.

The results of winter grazing tests for 1949-50 in Mississippi were reported by Leveck et al. (1950). Steer calves on all winter pasture crops tested gained 1.39 pounds per day or more. There was a range of \$15.75 to \$73.28 net return per acre for the crops used. Under these conditions winter pasture could be used profitably for calves in Mississippi.

Burton et al. (1949) reported the results of tests conducted at the Georgia Coastal Plains Experiment Station from 1933 to 1945. During this time four crops were tested for eight years. There was a great deal of variation, from one year to the next, in the amount of pasture available, and the authors stated that other feed must be on hand in case winter grazing is reduced by adverse growing conditions. This variation was approximately the same for the four crops tested. The four crops used for winter grazing were: Red Rustproof Oats; Abruzzi Rye; Italian Ryegrass; and Red Rustproof Oats and Hairy Vetch.

Short yearling steers and heifers weighing 300 to 500 pounds made from .61 to 1.14 pounds per day gain for the eight-year average. Abruzzi Rye produced the greatest gains but was second to Red Rustproof Oats and Hairy Vetch in live weight gain per acre. These tests averaged approximately 86 days in length and the grazing days per acre ranged from 51.56 to 92.68.

In the 61st annual report of the Georgia Experiment Station (1949), yearling beef gains on three types of winter pasture were reported. Grazing with yearling cattle gave 303 pounds gain per acre on oats, ryegrass and crimson clover as compared to 172 pounds per acre on first year fescue. Average daily gains varied from 2.5 to 2.76 pounds per head per day.

The grazing value of oats as winter pasture in Louisiana as reported by Walker and Sturgis (1946), was 92 pounds of beef per acre during the period of December 19 to March 5. Five heifers grazed on oats gained .90 pounds per head per day. After removal of the heifers the oats produced 21 bushels to the acre.

Kidder (1943) reported on winter pasture grazed with yearling and two-year-old steers on Florida pastures. Under conditions of these tests it did not pay to feed concentrates on pasture above the minimum amount of cottonseed meal.

Swanson and Anderson (1951) reported on tests conducted on winter wheat and supplemented with sorghum stover as dry feed. Grade 394 pound calves grazed on these pastures gained 1.42 pounds per day during the 127 day grazing period.

CHAPTER III

EXPERIMENTAL PROCEDURE

Cattle

Calves used were Hereford, Angus, Shorthorn and crosses between these breeds. Most of these calves were raised on the stations but to provide adequate numbers it was necessary to purchase some calves in the country or through auction sales. Calves were allotted as uniformly as possible on the basis of two-day weight, feeder and condition grade, sex, origin and other factors that might affect probably outcome.

Weights were taken on two consecutive days at the beginning and end of tests. An average of these weights was used for the initial and final weights. Feeder and condition grades were made each time by at least two qualified graders from the University of Tennessee. Calves were selected at random so that the grader had no idea of treatment and then graded individually. In most cases the graders worked individually and the grades used in this report represent an average. The initial price was the amount actually paid for the calves or, in the case of calves raised, an appraised price by a packer or other qualified buyer. Calves were appraised in the same manner as they were graded. Each calf was weighed every 28 days.

At the end of the test an individual two-day weight, grade, and appraised price was obtained for each animal. The cattle that were sold at the end of the test were trucked to the packing plant where a single individual weight was obtained.

When cattle were slaughtered, data were collected on dressing percent and carcass grade of each animal, and notes recorded on the condition of carcasses. Carcass grading was done by federal graders and the University meats man. Graders had no knowledge of previous treatment and, as in the case of other grades, the one reported here is an average.

All grades the first year and the initial feeder and slaughter grade the second year were on the federal grading system in effect prior to December, 1950 and all the other grades were based on the new standards. The average grade reported is an average of old and new grades with no attempt to change them to a comparable basis. It is questionable whether grades were actually raised as much as the U.S.D.A. standards indicated. Perhaps $1/2$ to $2/3$ of a grade would have been closer than a whole grade raise. Due to the uncertainty caused by the change, grading was not uniform and it was believed that no one factor would apply to put grades between years on a comparable basis, but that the average of all grades would be more representative.

Dressing percent was figured on the basis of selling and chilled carcass weights.

Feed costs were based on the local price for each station, as shown in appendix table VII.

In determining financial returns all costs were used except labor for feeding and charge for pasture. The conditions of the tests were such that carrying capacities for pastures were not determined. At

some stations other livestock were carried on the same pasture as the calves. At other stations the calves were put on extra pasture. Also other factors, such as benefits from winter pasture for erosion control and green manure, or the harvest of a seed crop in the spring, make it difficult to arrive at a fair charge for this pasture.

The cattle were fed once a day where hay was fed ad lib. A weighback of hay was taken if cattle were moved to another location and at the end of the project. Silage was fed once a day in quantities that would be just cleaned up by the next feeding.

Winter Pasture

Winter pastures were seeded in August and September. To insure continuous grazing fields having a soil and drainage which would be satisfactory for cattle to graze during the wet weather were used where possible. A good seed bed was prepared and soils were fertilized according to needs. In general, a combination of 15 pounds of crimson clover and 2-1/2 bushels of oats per acre was used in these tests. Balbo rye was used instead of oats at the M.T.E.S. Ryegrass and Balbo rye were used in the place of oats at T.E.S. one year. Balbo rye and ryegrass were seeded at recommended rates. It was estimated by the station superintendents that the cost of land preparation, fertilization and seeding for winter pasture was approximately \$20.00 per acre each year.

Permanent Pasture

This was a pasture of grass and clover that was grazed during the summer. Cattle were taken off and growth allowed to accumulate in the fall.

This excess growth was used for grazing during the wintering tests.

Concentrates

The concentrate mixture was corn-cob meal and cottonseed meal except at the main station where ground corn was used instead of corn-cob meal. The rations of 2-1/2 pounds of concentrates per animal per day contained a ratio of 1 part corn-cob meal to 1 part cottonseed meal. Similarly, rations of 5 pounds concentrates daily contained a ratio of 3 to 1.

Hay

Where hay was the only roughage fed, it was fed free choice. When hay was fed with silage it was fed at the rate of 2 pounds per head per day. The quality of hay used in these tests ranged from very good alfalfa to poor lespedeza-crabgrass hay.

Silage

The quality of the silage fed varied from very good to poor. Corn, corn-sorghum and grass silage were used at the different stations.

Statistics

In analyzing the data a weighted average was used within each year and an unweighted average was used in summarizing data for all years. The analysis of variance was run on average daily gain, dressing percent, final slaughter grade, and carcass grade. The results of the statistical analyses are found in the appendix.

CHAPTER IV

RESULTS AND DISCUSSION

Tobacco Experiment Station

Heifer calves weighing about 465 pounds and grading good to high good as feeders and low good to good as slaughter calves were started on test about November 10 each year. The first year, 1949-50, these calves were on test 166 days and in 1950-51 and 1951-52 they were on test 195 days. The heifers used on these tests were raised at the station with the exception of three or four heifers each year. The heifers used to complete the numbers needed came from one of the other stations.

Crimson clover and oat pastures were used the first two years. Balbo rye, ryegrass and crimson clover pasture was used the third year.

The first year of this test the winter pasture was very good. The second year the winter pasture was the poorest in many years, being held back by dry and cold weather. The third year pasture conditions were intermediate and probably nearer to those expected during a normal season.

The calves had access to pasture at all times during the three years except for three days the first year. Each year the cattle on winter pasture had access to 16 acres but sheep were also grazed on this pasture part of the time. The cattle on permanent pasture were given 2 acres of pasture per head.

The hay fed at this station was of medium grade. Corn silage of about average quality was used.

The final appraised price on these heifers was a slaughter price.

Average results of the tests during the winters of 1949-50, 1950-51 and 1951-52 are given in table I. Results for each year are in appendix tables VIII, IX and X. The results of the statistical analyses are given in appendix tables XI, XII, XIII and XIV.

Calves in lots 1 and 2 were on winter pasture and hay plus 0 and 5 pounds of concentrate daily. Lot 3 was fed 5 pounds of concentrate daily plus hay and permanent pasture. Lot 4 received 5 pounds of concentrate, 2 pounds of hay per animal daily and silage ad lib.

Under conditions of this test the calves in Lot 2, receiving winter pasture, hay and 5 pounds of concentrates, outgained the other lots approximately 48 pounds per head. The heifers in Lots 3 and 4, while not making as rapid gains, showed more consistent gain from year to year than those in Lot 2. The gains of the calves in Lot 1 fluctuated more (1.70 to 1.09 per day per head) than the gains in the other lots. The gain of the cattle in Lots 1 and 2 was governed by the amount of winter pasture available. Thus, plenty of winter pasture for calves in 1949-50 and 1951-52 resulted in more rapid gains and a shortage of winter pasture in 1950-51 resulted in comparatively lower gains.

The calves in Lot 1 were wintered for a cost of \$4.23 per 100 pounds gain, exclusive of pasture, which was from \$7 to \$15 per 100 pounds cheaper than any other lots.

TABLE I

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER PASTURE,
SILAGE, HAY AND CONCENTRATES FOR FATTENING
OR WINTERING BEEF CALVES

Tobacco Experiment Station
1949-50, 1950-51 and 1951-52

	1	2	3	4
	Winter Pasture Hay 5 lbs. Conc.	Winter Pasture Hay 5 lbs. Conc.	Permanent Pasture Hay 5 lbs. Conc.	Silage 2 lbs. Hay 5 lbs. Conc.
No. animals in lot	5.3	5.3	5	5
No. days on experiment . .	186	186	186	186
Av. initial wt., lbs. . . .	465	461	467	465
Av. final wt.	728	773	736	735
Av. total gain	263	312	269	270
Av. daily gain (b)	1.41	1.68	1.45	1.46
Av. daily feed:				
Hay	3.6	3.7	4.6	2.0
Silage				23.8
Concentrate		4.9	4.7	5.0
Av. feed per cwt. gain:				
Hay	281	237	313	137
Silage				1622
Concentrate		292	327	341
Av. total feed cost per cwt. gain (a)	4.23	11.86	13.73	19.04
Av. total feed cost per head(a)	10.01	36.13	37.00	51.43
Av. initial cost	129.63	128.40	131.34	131.82
Av. total cost (a)	139.64	164.53	168.34	183.25
Av. initial feeder grade .	G /	HG-	HG-	HG /
Av. initial slaughter grade	G-	LG /	G /	G /
Av. percent shrink TES to Knoxville	7.1	6.2	6.4	5.7
Av. dressing percent (c) .	58.3	60.3	56.9	57.8
Av. final slaughter grade(d)	HG-	LC	HG /	HG /
Av. final carcass grade (e)	G-	HG-	LG /	HG
Av. selling price, per cwt.	30.10	30.75	29.87	30.63
Av. returns per head . . .	218.58	237.28	220.11	225.25
Av. net returns per head (a)	78.95	72.75	51.77	42.00

(a) Exclusive of pasture cost.

(b) Significant at the 1 percent level for treatment and years.

(c) Significant at the 1 percent level for treatment.

(d) Significant at the 1 percent level for years.

(e) Significant at the 1 percent level for treatment.

On a dry matter basis, estimating $2\frac{1}{2}$ to 3 pounds of silage to be equal to 1 pound of hay, in a comparison of Lot 1 with Lot 4 winter pasture saved approximately 1175 to 1475 pounds of hay and 900 pounds of concentrate per head for the 186-day feeding period. The permanent pasture in Lot 3 replaced approximately 1000 to 1300 pounds of hay per head when compared with Lot 4. Because other livestock used the same pasture as the cattle on test it was impossible to obtain carrying capacity figures on the pastures. Comparing the good winter pasture seasons, first and third, to the poor season, second, it took approximately twice as much hay (2.6 to 5.8 pounds per animal daily) for the cattle during the poor season.

There was very little difference in the selling price of the four lots, but the cattle from Lot 3, permanent pasture, hay and concentrate, brought slightly less than the cattle from the other lots. The Lot 2 cattle made the most rapid gains and sold for the highest price.

The difference in dressing percentage between lots was highly significant. The cattle from Lot 2 dressed the highest at 60.3 percent and Lot 3 the lowest at 56.9 percent.

The carcasses produced by these four rations averaged from low good to high good and were very acceptable to the meat trade in this area. The carcasses from Lot 4, silage, hay and concentrate, graded highest and those from Lot 3, permanent pasture, hay and concentrate, lowest. In general the average of the live animal slaughter grades was higher than the average of the carcass grades. Comparing the initial to the final

slaughter grades for all lots, the rations used in these tests did not appreciably raise the grades. This would indicate that calves grading lower than good for slaughter in the fall probably would not have sufficient condition, under the conditions of these tests, to sell for slaughter in the spring.

The three-year average net return per head, exclusive of pasture costs, was highest for Lot 1, winter pasture and hay. Lot 1 returned \$78.95 per head which was \$6.20, \$27.18 and \$36.95 per head more than for Lots 2, 3 and 4, respectively. However, the second year, when winter pasture was short, cattle in Lots 2 and 3, receiving concentrates, returned more than Lot 1 with no concentrates. No charge has been made for winter pasture. Although it was estimated that winter pasture cost \$20 per acre, no figures were available on carrying capacity.

Under the conditions of these tests winter pasture would have been worth \$36.95 per head in Lot 1 and \$30.75 per head in Lot 2 as measured in returns over Lot 4. The acreage of winter pasture to which increase would apply would depend upon the carrying capacity of the pasture which in turn depends upon the amount of winter pasture grown in the fall and winter and the ration fed to calves on the pasture. In these tests, comparing Lot 3 to Lot 4, permanent pasture was worth \$9.77 per animal. These results showed that each year all lots of cattle made more money than had they been sold at weaning time.

Summary

Heifer calves, weighing about 465 pounds and grading good to choice as feeders, were used to test four rations:

Lot 1 - winter pasture and hay.

Lot 2 - winter pasture, hay and 5 pounds of concentrates.

Lot 3 - permanent pasture, hay and 5 pounds of concentrates.

Lot 4 - silage, 2 pounds of hay and 5 pounds of concentrates.

The cattle from Lot 1 had the largest net return, \$78.95 per head, exclusive of pasture cost. Comparing the net returns, Lot 1 returned \$6.20, \$27.18 and \$36.95 per head more than Lots 2, 3 and 4, respectively.

The ration fed in Lot 2 produced more gain per head than the other rations tested. Heifers on winter pasture and hay, Lot 1, made the most variable gains from year to year and the cheapest gains exclusive of pasture cost.

In a comparison of Lot 1 to Lot 4, winter pasture replaced 1175 to 1475 pounds of hay and 900 pounds of concentrates. Likewise, comparing Lot 3 to Lot 4, permanent pasture replaced 1000 to 1300 pounds of hay per animal.

The packers considered the carcasses from the heifers in these tests very desirable for the meat trade in this area.

It did not pay to feed concentrate on winter pasture except during the winter when winter pasture was poor. Comparing Lots 2 and 3, the heifers on winter pasture made more gain and greater returns than those on permanent pasture.

The estimated cost of producing winter pasture for these tests was \$20 per acre.

The carrying capacity of winter pasture depends on the amount of growth in the fall and winter and the amount of concentrate fed to the cattle on pasture.

All rations tested produced cattle that returned more net profit per head, exclusive of pasture cost, than if they had been sold at weaning time.

Main Experiment Station

Steer and heifer calves were used the first two years and steers the third year. The calves averaged weighing about 485 pounds and grading high good as feeders and good as slaughter cattle when they started on test December 7, November 21 and December 14, respectively. The cattle were on test 145, 153 and 137 days for the respective years. At the end of each test the cattle were carried on and eventually full-fed for use in resident teaching classes.

The winter pasture was crimson clover and ryegrass. As in the case of the other stations, the first year (1949-50) winter pasture was very good and the calves had an excess most of the time. The second year (1950-51) the winter pasture was very poor. During the middle of the test there was not sufficient pasture. The third year the calves had plenty of pasture at all times. The hay fed was medium quality alfalfa. The appraised final price used for these cattle was a slaughter price. In the second year all cattle were appraised higher as stockers but the slaughter appraisal was used to evaluate all prices on the same basis.

Rations used for Lots 2 and 3 were tested for the three years while the rations fed Lot 1 was tested only the last two years. Table II contains the average results of Lots 1, 2 and 3 for 1950-51 and 1951-52. Table III contains the average results of Lots 2 and 3 for 1949-50, 1950-51 and 1951-52. Results for each year are in appendix tables XV, XVI and XVII. The results of the statistical analyses are given in appendix tables XVIII and XIX.

Calves in these tests were on the following rations: Lot 1, winter pasture and hay; Lot 2, winter pasture, hay and 5 pounds of concentrates; and Lot 3, hay and 5 pounds of concentrates.

The calves that made the highest gains in these tests were from Lot 2. Cattle in Lot 2 outgained calves in Lot 1, 39 pounds per head and calves in Lot 3, 31 pounds per head, in the 145 day period. There was no appreciable difference in gain of calves in Lots 1 and 3. Gains made by calves on winter pasture were more variable from year to year than gains made by calves on hay and concentrates.

As was shown in the tests at the Tobacco Experiment Station, winter pasture and hay produced the cheapest gains. Winter pasture replaced 827 pounds of hay and 696 pounds of concentrates in 145 days, as shown by a comparison of Lots 1 and 3 for the two years studied.

Lots 2 and 3 sold for over 50 cents per hundred weight more than Lot 1. There was no appreciable difference in selling price between Lots 2 and 3.

Since these cattle were carried on for use in resident teaching no carcass or dressing percent figures are available.

TABLE II

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER PASTURE,
HAY AND CONCENTRATES FOR FATTENING
OR WINTERING BEEF CALVES

Main Experiment Station
1950-51 and 1951-52

	1 Winter Pasture Hay	2 Winter Pasture Hay 5 lbs. Conc.	3 Hay 5 lbs. Conc.
No. animals in lot	9.5	9.5	9.5
No. days on experiment	145	145	145
Av. initial wt. lbs.	492	487	490
Av. final wt.	688	722	694
Av. total gain	196	235	204
Av. daily gain (b) (c)	1.38	1.65	1.42
Av. daily feed:			
Hay	6.0	6.0	11.7
Concentrate		4.8	4.8
Av. feed per cwt. gain:			
Hay	534	419	854
Concentrate		317	351
Av. total feed cost per cwt. gain (a)	8.00	18.04	25.86
Av. total feed cost per head (a)	13.33	39.26	51.88
Av. initial cost	161.97	160.56	161.67
Av. total cost (a)	175.30	199.82	213.55
Av. initial feeder grade	HG +	LC-	HG +
Av. initial slaughter grade	G +	G-	G-
Av. final slaughter grade	G +	HG	G +
Av. selling price	30.45	31.06	31.13
Av. returns per head	209.54	224.86	216.08
Av. net returns per head (a)	34.24	25.04	2.54

(a) Exclusive of pasture cost.

(b) Significant at the 1 percent level for treatment and year.

(c) Significant at the 5 percent level for year X treatment.

TABLE III

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER
PASTURE, HAY AND CONCENTRATES FOR FATTENING
OR WINTERING BEEF CALVES

Main Experiment Station
1949-50, 1950-51 and 1951-52

	2 Winter Pasture Hay 5 lbs. Conc.	3 Hay 5 lbs. Conc.
No. animals in lot	10	10
No. days on experiment	145	145
Av. initial wt. lbs.	483	487
Av. final wt.	740	684
Av. total gain	256	197
Av. daily gain (b) (c)	1.78	1.37
Av. daily feed:		
Hay	4.8	11.7
Concentrate	4.9	4.9
Av. feed per cwt. gain:		
Hay	321	874
Concentrate	293	364
Av. total feed cost per cwt. gain (a)	15.25	25.72
Av. total feed cost per head (a) . . .	35.78	50.27
Av. initial cost	141.95	142.98
Av. total cost (a)	177.73	193.27
Av. initial feeder grade	LC-	HG/
Av. initial slaughter grade	G-	G
Av. final slaughter grade	HG	G/
Av. selling price	29.54	29.04
Av. returns per head	218.27	199.19
Av. net returns per head (a)	40.54	5.93

(a) Exclusive of pasture cost.

(b) Significant at the 1 percent level for treatment and year X treatment.

(c) Significant at the 5 percent level for years.

The final slaughter grade was highest for Lot 2, high good, as compared with good for Lots 1 and 3. In these tests, as in others, the rations used did not materially raise the slaughter grade from initial to final.

Cattle on winter pasture and hay, Lot 1, returned, exclusive of pasture cost, \$9.20 and \$31.70 per head more than cattle from Lots 2 and 3, respectively.

Comparing calves in Lots 2 and 3 for three years, as shown in Table III, the calves in Lot 2, winter pasture, concentrate and hay, made higher gains, sold for a higher price, graded high and returned more money per head, exclusive of pasture costs, than the calves in Lot 3 receiving concentrates and hay.

Summary

Steer and heifer calves weighing approximately 490 pounds were used at this station to test three rations:

1. Winter pasture and hay.
2. Winter pasture, hay and 5 pounds of concentrates.
3. Hay and 5 pounds of concentrates.

In these test cattle on a ration of winter pasture and hay, Lot 1, made cheaper gains and had a greater net return per head, exclusive of pasture costs, than the cattle in Lots 2 and 3.

It did not pay to feed concentrates on winter pasture comparing Lots 1 and 2.

Winter pasture, as used in the ration for calves in Lot 1, replaced 827 pounds of hay and 696 pounds of concentrates in the 145 day period.

There was very little difference in the final appraised price but the calves from Lot 1 were appraised approximately 60 cents per hundred weight below Lots 2 and 3.

On the average, the final slaughter grades of the calves in these tests were not raised by these rations when compared to their initial slaughter grades.

Calves on rations in Lots 1 and 2 returned more net profit per head, exclusive of pasture costs, than if they had been sold at weaning time.

Middle Tennessee Experiment Station

Steer and heifer calves averaging about 455 pounds and grading good to high good as feeders and low good to good for slaughter were started on test October 31 and November 15, respectively. In the two years this study was made the cattle were carried on test about 190 days. In the second test, the calves that were purchased were smaller in type, approaching or being so called "comprest".

The two years that this test was carried on, 1949-50 and 1950-51, represented one of the best winter pasture seasons and one of the worst, respectively, on record. Crimson clover and oats were used the first year for winter pasture with Balbo rye replacing the oats

during the second year. In the first test the winter pasture was on low, wet land. Because the soil was too wet, the cattle had to be taken off seven times during the test for a total of 29 days.

During the first year the calves had an excess of winter pasture except for periods when cattle were removed because of wet soil. The second year each lot of 5 animals grazed 4.5 acres of winter pasture and at times the pasture was short. In the second test cattle were moved from winter to permanent pasture for the last 30 to 40 days. The calves on silage, hay and concentrates were fed in an open barn with no access to outside lots.

Good quality corn and sorghum silage and hay was fed at this station. In general the quality of hay and silage was better than that fed at other stations. The final appraised price on these cattle was a slaughter price. There were only a few cattle that would have brought more as stockers.

Average results of the tests during winter of 1949-50 and 1950-51 are given in table IV. Results for each year are in appendix tables XX and XXI. The results of the statistical analyses are given in appendix tables XXII, XXIII, XXIV and XXV.

The gains made by calves on test ranged from 1.18 pounds per day per head for Lot 1, winter pasture and hay, to 1.69 for calves in Lot 5, silage, hay and 5 pounds of concentrates.

The calves on rations of silage, hay and concentrate outgained the calves on rations with winter pasture. There was very little difference in

gain between Lots 2 and 3, winter pasture, hay and $2\frac{1}{2}$ and 5 pounds of concentrates. However, these two lots outgained Lot 1, approximately 50 pounds per head. The first year, when steers and heifers were allotted so it was possible to make a comparison, the steers outgained the heifers 20 pounds.

The calves on the winter pasture and hay treatment made cheaper gains exclusive of pasture cost than the calves on the other rations. The calves on rations with $2\frac{1}{2}$ pounds of concentrates gained approximately the same but at less cost per head than those fed similar rations with 5 pounds of concentrates.

The amount of hay per head required to winter calves on winter pasture varied from about 3 to 7 pounds per head per day. The amount required depended on the supply of winter pasture. Although there is quite a saving in hay when comparing Lot 1 with 4 or 5, there is so much difference in gain that it was felt this would not be a realistic figure. The calves in the barn on silage, hay and 5 pounds of concentrates daily consumed 3 to 6 pounds less silage per head per day than the calves on silage, hay and $2\frac{1}{2}$ pounds of concentrates daily. It was also observed that the calves on pasture with the higher amount of concentrates did not graze their grass as close as the calves on rations containing less or no concentrates.

The selling price of the cattle had a spread of \$1.79 per hundred weight. The calves in Lot 1, winter pasture and hay, were appraised lower than the other groups. Both groups on silage, hay and concentrates outsold the cattle on rations with winter pasture.

TABLE IV

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER
PASTURE, SILAGE, HAY AND CONCENTRATES FOR
FATTENING OR WINTERING BEEF CALVES

Middle Tennessee Experiment Station
1949-50 and 1950-51

	1	2	3	4	5
	Winter Pasture Hay	Winter Pasture Hay 2.5 lbs. Conc.	Winter Pasture Hay 5 lbs. Conc.	Barn Silage 2 lbs. Hay 2.5 lbs. Conc.	Barn Silage 2 lbs. Hay 5 lbs. Conc.
No. animals in lot	5.5	5.5	5.5	5.5	5
No. days on experiment	189.5	189.5	189.5	189.5	189.5
Av. initial wt. lbs.	460	456	452	462	458
Av. final wt.	684	738	720	766	778
Av. total gain	224	282	268	304	320
Av. daily gain (b)	1.18	1.49	1.41	1.60	1.69
Av. daily feed:					
Hay	4.6	4.0	3.6	2.0	2.0
Silage				22.2	17.6
Concentrate		2.2	4.3	2.48	4.93
Winter pasture	ad lib	ad lib	ad lib		
Av. feed per cwt. gain:					
Hay	380	264	277	126	120
Silage				1392	1048
Concentrate		147	304	156	292
Av. total feed cost per cwt. gain (a)	6.24	9.09	12.36	12.38	13.61
Av. total feed cost per head (a)	15.48	26.20	33.98	38.13	43.78
Av. initial cost	115.90	114.72	114.10	116.56	115.39
Av. total cost (a)	131.38	140.92	148.08	154.69	159.17
Av. initial feeder grade	G /	G /	HG-	HG-	HG-

TABLE IV

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER
PASTURE, SILAGE, HAY AND CONCENTRATES FOR
FATTENING OR WINTERING BEEF CALVES (continued)

Middle Tennessee Experiment Station
1949-50 and 1950-51

	1	2	3	4	5
	Winter Pasture Hay	Winter Pasture Hay 2.5 lbs. Conc.	Winter Pasture Hay 5 lbs. Conc.	Barn Silage 2 lbs. Hay 2.5 lbs. Conc.	Barn Silage 2 lbs. Hay 5 lbs. Conc.
Av. initial slaughter grade . . .	LG	G-	LG ⁺	G-	G-
Av. percent shrink. MTES to Nashville	1.2	2.2	1.8	1.1	2.3
Av. dressing percent	54.6	56.7	58.2	58.5	58.8
Av. final slaughter grade (c)	H Com ⁺	LG ⁺	G ⁺	G ⁺	HG ⁺
Av. carcass grade (d)	Com ⁺	H Com ⁺	G-	HG-	HG-
Av. selling price per cwt.	28.33	28.98	29.76	30.12	30.08
Av. returns per head	193.78	213.92	214.30	230.76	233.99
Av. net returns per head (a) . . .	62.41	73.00	66.22	76.07	74.82

(a) Exclusive of pasture costs.

(b) Significant at the 1 percent level for year and treatment.

(c) Significant at the 5 percent level for treatment.

(d) Significant at the 1 percent level for treatment.

There was a four percent spread in dressing percent, Lot 1 compared to Lot 5. All other lots fell between these two extremes with little difference between Lots 3, 4 and 5.

The final slaughter grade was slightly higher than the carcass grade but showed almost the same lot comparison. Carcass grades followed amount of gains very closely. With the rations used for these tests the carcass grade, commercial to high good, differed very little from the initial slaughter grade. Most of the calves on these tests produced carcasses of the grade and weight desired by Tennessee consumers.

The net returns from calves used on these tests were highest for the silage, hay and concentrate groups, approximately \$75 per head. However, the rations with winter pasture produced calves that returned over \$60 per head net, exclusive of pasture cost. This means that the winter pasture would be worth over \$60 for sufficient pasture to graze one calf for 190 days. As mentioned for one of the other stations this unit of pasture depends upon the conditions governing winter pasture growth. It should be pointed out that if the same unit of land in winter pasture required to carry one calf 190 days had been put in corn or sorghum silage the amount of silage produced from that unit of land would winter several calves. Considering the net return per head in these tests it paid to feed grain on winter pasture as shown by comparing Lot 1 with 2 and 3.

In the second year two sources of calves were used; one group was raised on the station and the other group was purchased. The purchased calves were of the so-called "comprest" type. The calves

produced on the station gained 61 pounds per head more and had a net return of \$38 per head greater than the purchased calves. This demonstrated the importance of correct type and breeding for maximum returns.

Summary

Steer and heifer calves weighing approximately 450 pounds were used at this station to test five rations:

1. Winter pasture and hay.
2. Winter pasture, hay and $2\frac{1}{2}$ pounds of concentrates.
3. Winter pasture, hay and 5 pounds of concentrates.
4. Silage, 2 pounds of hay, and $2\frac{1}{2}$ pounds of concentrates.
5. Silage, 2 pounds of hay and 5 pounds of concentrates.

In these tests rations containing silage, hay and concentrates produced cattle that made higher gains and had a larger net return per head than cattle produced on rations containing winter pasture.

The amount of grazing from winter pasture depends upon the growing conditions in the fall and winter.

The calves produced on the station had a net return of \$38 per head more than the purchased so-called "comprest" type.

The calves on these rations produced desirable carcasses for the Tennessee trade.

The rations used did not raise the carcass grade of the calves when compared to the initial slaughter grade.

At this station it paid to feed $2\frac{1}{2}$ to 5 pounds of concentrates per head per day on winter pasture.

All rations produced calves that had a net return, exclusive of pasture cost, of over \$60 per head. This represents the amount that the calves returned over selling them at weaning time.

West Tennessee Experiment Station Light Calves

Steer calves the first year and steer and heifer calves the second year, weighing approximately 450 pounds and grading good as feeders and commercial for slaughter, were started on test December 14, 1949 and December 13, 1950. The cattle were carried on test an average of 112 days for the two years. The calves used at this station were purchased and most of them came from the country or auction markets. A few of the heifer calves came from one of the other stations. At the end of the winter period, about April 10th, these cattle were re-divided and put on summer grazing tests.

During the first winter, 1949-50, the calves were carried on very good crimson clover and rye grass pasture. The calves in Lots 4 and 5 grazed 93 of the 112 days. Lot 6 was on pasture 112 days. During the second winter, 1950-51, the cattle were able to graze crimson clover and rye grass only 64 of the 111 days due to snow and other adverse conditions.

Medium to poor quality Lespedeza hay was used. Average quality corn-sorghum silage was used during the first year, while medium to poor quality legume and grass silage was used the second year.

The appraised price put on these calves was a stocker price with the exception of Lot 6. The first year Lot 6 carried enough finish to have sold for slaughter.

Average results for the tests during the winter of 1949-50 and 1950-51 are given in table V. Results for each year are given in appendix table XXVIII.

Cattle in Lots 4 and 5, weather permitting, grazed winter pasture during the day and, at night in the barn, were fed hay and $2\frac{1}{2}$ and 0 pounds of concentrate per animal daily, respectively. Calves in Lot 6 received $2\frac{1}{2}$ pounds of concentrate daily and were wintered outside on a bermuda sod with access to woods for protection. When weather permitted they grazed the crimson clover, rye grass winter pasture.

Lots 4 and 6 received the same ration, winter pasture, hay and $2\frac{1}{2}$ pounds of concentrates per head per day, but Lot 6 was outside all the time. The calves in Lot 6 gained 0.22 pounds daily more than the calves in Lot 4 and required 185 pounds of hay and 76 pounds of concentrates less per 100 pounds gain. Lot 6 would have returned \$11.58 per head more than Lot 4.

Comparing Lots 4 and 5, handled the same except Lot 4 received $2\frac{1}{2}$ pounds of concentrates daily, calves in Lot 4 gained 0.15 pounds per day more, had a feed cost of \$3.41 per 100 pounds gain more and were appraised at \$0.37 per hundred weight less than Lot 5. The year that pasture was good the calves in Lot 5, winter pasture and hay, returned \$7.15 per head more than the cattle in Lot 4, winter pasture, hay and $2\frac{1}{2}$ pounds of concentrate, but the year the pastures were poor they returned about the same. Calves in Lot 6 gained 0.37 pounds more per day, were appraised slightly higher and returned \$6.10 per head more than cattle in Lot 5.

TABLE V

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER PASTURE,
SILAGE, HAY AND CONCENTRATES FOR FATTENING OR
WINTERING LIGHT BEEF CALVES

West Tennessee Experiment Station
1949-50 and 1950-51

	4	5	6	7	8	9	10
	Winter Pasture Hay 2.5 lbs. Conc. Barn at night	Winter Pasture Hay Barn at night	Winter Pasture Hay 2.5 lbs. Conc. Outside all the time	Silage 2.5 lbs. Conc.	Hay 2.5 lbs. Conc.	Silage 5 lbs. Conc.	Hay 5 lbs. Conc.
No. animals	9	9	9	6	6	6	6
No. days on experiment	112	112	112	112	112	112	112
Av. initial wt. lbs.	459	458	457	458	447	460	458
Av. final wt.	576	560	600	585	546	614	592
Av. total gain	117	102	143	127	99	154	134
Av. daily gain (b) ..	1.06	.91	1.28	1.14	.89	1.38	1.20
Av. daily feed:							
Hay	4.2	5.4	3.0		10.4		10.3
Silage				28.0		25.9	
Concentrate	2.5		2.4	2.9	2.9	5.0	5.0
Av. feed per cwt. gain:							
Hay	558	1067	373		1184		863
Silage				2458		1897	
Concentrate	308		232	264	332	369	420
Av. feed cost per cwt.							
gain (a)	14.13	10.72	10.17	16.52	20.96	15.89	20.76
Av. feed cost per head(a)	12.28	6.08	10.65	20.62	20.55	24.16	24.81
Av. initial cost ..	114.57	114.21	114.12	114.48	111.63	114.80	114.18
Av. total cost (a) ..	126.86	120.30	124.77	135.11	132.18	138.96	138.99
Av. initial feeder grade	G	G	G	G	G	G	G
Av. initial slaughter	Comp	Comp	H Com	Comp	Comp	Comp	Comp
Necessary price to							
break even ..	22.05	21.53	20.82	23.10	24.23	22.75	23.53
Av. appraised price (c)	28.84	29.21	29.34	29.10	28.90	29.18	29.25
Av. returns per head	162.90	159.81	172.40	169.17	157.33	177.77	172.12
Av. net returns per							
head (a)	36.04	39.52	47.62	34.06	25.14	38.82	33.14

(a) Exclusive of pasture costs.

(b) Significant at the 1 percent level for year and treatments and at the 5 percent level for year X treatment.

(c) With exception of Lot 6 in 1949-50 all prices are stocker.

Calves in Lots 7 and 9 on silage plus $2\frac{1}{2}$ pounds and 5 pounds of concentrate daily, gained 0.2 to 0.3 pounds more per day, respectively, than calves in Lots 8 and 10 receiving hay plus $2\frac{1}{2}$ and 5 pounds of concentrate. Silage-fed cattle averaged returning \$7.30 per head more than the cattle fed hay.

Lot 6, exclusive of pasture costs, made the highest returns for these tests, \$47.62 per head. Lot 9 returned \$38.82 per head which was the highest return for any hay- or silage-fed lot. The amount of winter pasture required to carry a calf under these conditions would have been worth only \$8.80 per head compared to a ration of silage and 5 pounds of concentrates daily as shown by a comparison of Lots 6 and 9.

In the first year, 1949-50, the average daily gains were higher and feed required per hundred pounds of gain was lower than the second year. Especially was this true of winter pasture where average daily hay consumption in Lot 6 ranged from 1 pound daily per head the first year to 5 pounds per head per day the second year. Silage consumption was down about 5 pounds per head per day the second year probably due to the legume grass silage being dry and not as palatable as the corn silage.

Comparing the average daily gain of steers and heifers for the second year, there was no difference.

Summary

At this station, seven rations were tested with calves weighing approximately 450 pounds. The treatments were:

Lot 4 - winter pasture, hay, $2\frac{1}{2}$ pounds of concentrates and in the barn at night.

Lot 5 - winter pasture, hay and in the barn at night.

Lot 6 - winter pasture, hay, $2\frac{1}{2}$ pounds of concentrates and outside all the time.

Lot 7 - silage and $2\frac{1}{2}$ pounds of concentrates.

Lot 8 - hay and $2\frac{1}{2}$ pounds of concentrates.

Lot 9 - silage and 5 pounds of concentrates.

Lot 10 - hay and 5 pounds of concentrates.

Under the conditions of these tests, cattle wintered outside on the same ration as cattle put in the barn at night made greater gains and had a higher net return. However, it is not known if this was the effect of barn or just more feed was available for the lot running outside all the time.

Calves wintered on silage and concentrate rations made greater gains, 0.2 to 0.3 pounds per day, and more net return (\$5 to \$9) per head than did calves on comparative rations of hay and concentrate.

Exclusive of pasture cost, Lot 6 with winter pasture, hay, $2\frac{1}{2}$ pounds of concentrate and outside all the time made the greatest net return.

The calves used in these tests started with a slaughter grade of commercial and, as in the case at other stations, the slaughter grade was not raised. These calves would have sold as stocker rather than slaughter cattle.

It did not pay to feed concentrates to calves on winter pasture and in the barn at night. However, cattle receiving concentrates and

outside all the time, Lot 6, did return more than the cattle in Lot 4 on winter pasture receiving no concentrates.

Calves on these rations made a net return, exclusive of pasture cost, of \$25 to \$47 per head more than if they had been sold at weaning time.

West Tennessee Experiment Station Heavy Calves

Steers were used in tests during the first and third years and steers and heifers the second year. The calves averaged 570 pounds, graded good as feeders and high commercial for slaughter. The cattle were started on test about the 15th of December and carried for 170 days. The source of these calves was the same as those of Lots 4 - 10.

In general, the feed conditions for the first two years, 1949-50 and 1950-51, was the same as for the cattle in Lots 4 - 10. During the third year the winter pasture made a poor start and was damaged by a freeze in November but, for the whole grazing period, the winter pasture was average or better. In the third year with exception of 26 days at the beginning of the test, Lot 1 was on pasture every day. These cattle were grazed on good quality permanent pasture from April 10 until they were sold in June.

The hay used during the third year was of better quality than that used the other two years. Good quality corn and sorghum silage was used during the third year.

The final appraised price on these cattle was a slaughter price.

The average results of this test are given in table VI. The results for each year are in appendix tables XXIX, XXX and XXXI. The results of the statistical analysis are given in appendix tables XXXII, XXXIII, XXXIV and XXXV.

The calves in Lot 1 had access to winter pasture during the day and were in the barn at night where they were fed hay and 5 pounds of concentrates daily. At the end of the winter period, April 10, these calves were turned on permanent pasture and the concentrate was increased to 10 pounds daily. The cattle were carried on this ration until sold in early June. Lots 2 and 3 were fed 5 pounds of concentrates daily plus silage and hay, respectively. After April 10 these cattle remained on silage and hay but the concentrate feeding was increased to 10 pounds per head daily. As in the case of Lot 1 the cattle were then carried on this ration until sold in early June.

The calves fed silage in Lot 2 gained 0.14 pounds per day more, had a higher average carcass grade and made a net return of \$13.41 per head greater than the cattle on hay in Lot 3. The silage-fed cattle brought over \$1.00 per hundred weight more than the hay-fed calves.

The calves in Lot 1 on pasture gained about the same as those in Lot 2 and 0.11 pounds daily more than those in Lot 3. Lot 1 calves dressed 1.5% higher than Lot 2 calves and 2% higher than Lot 3 calves but was graded between Lots 2 and 3 in the carcass. The calves in Lot 1 made an average net return of \$54.19 per head, exclusive of pasture cost, which made pasture return \$20.13 per head more than silage and \$33.54 per head more than hay.

TABLE VI

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER PASTURE,
SILAGE, HAY AND CONCENTRATES FOR FATTENING OR
WINTERING HEAVY BEEF CALVES

West Tennessee Experiment Station
1949-50, 1950-51 and 1951-52

	1	2	3
	Winter pasture Hay, 5 lbs. Conc. to Apr.10 then P.P. and 10 lbs. Conc.	Silage, 5 lbs. Conc. to Apr. 10 then Silage and 10 lbs. Conc.	Hay, 5 lbs. Conc. to Apr.10 then Hay and 10 lbs. Conc.
No. animals in lot	10	5.7	5.7
No. days on experiment . .	170	170	170
Av. initial wt., lbs. . . .	568	571	570
Av. final wt.	845	853	829
Av. total gain	277	282	259
Av. daily gain	1.63	1.66	1.52
Av. daily feed:			
Hay	3.5		13.1
Silage		32.8	
Concentrate	5.7	7.1	6.7
Av. feed per cwt. gain:			
Hay	322		856
Silage		1973	
Concentrate	361	408	450
Av. total feed cost per cwt. gain (a)	11.38	18.44	21.29
Av. total feed cost per head(a)	30.16	51.91	55.36
Av. initial cost	157.08	157.37	157.13
Av. total cost (a)	187.24	209.28	212.49
Av. initial feeder grade .	G	G ⁺	G ⁺
Av. initial slaughter grade	H Com ⁺	H Com	H Com-
Av. percent shrink	2.7	4.2	3.5
Av. dressing percent . . .	56.5	55	54.6
Av. final slaughter grade	LG ⁺	LG ⁺	H Com ⁺
Av. final carcass grade .	H Com	H Com ⁺	H Com-
Av. selling price	29.41	29.81	28.76
Av. returns per head . . .	241.43	243.33	233.14
Av. net returns per head (a)	54.19	34.06	20.65

(a) Exclusive of pasture costs.

The second year when steers and heifers were compared the steers gained 1.51 and the heifers 1.23 pounds per head daily. However, as in the case at Middle Tennessee Experiment Station, no difference was found between steers and heifers in dressing percentage and slaughter or carcass grade.

The average daily gain was low the second year which was probably due to the poor quality feed and the lack of winter pasture. In the third year Lot 3 lost \$3.00 per head and was the only lot to lose money in the tests at this station.

Summary

Calves weighing 570 pounds were used to test three rations at the West Tennessee Experiment Station. These rations were:

- Lot 1. Winter pasture, hay, 5 pounds of concentrates to April 10 and permanent pasture and 10 pounds of concentrates.
- Lot 2. Silage, 5 pounds of concentrates to April 10 and then silage and 10 pounds of concentrates.
- Lot 3. Hay and 5 pounds of concentrates to April 10 and then hay and 10 pounds of concentrates.

The calves on winter pasture and silage rations gained approximately the same but exclusive of pasture cost, the calves on winter pasture returned \$20.00 more per head.

The calves on the silage and concentrate ration outgained and made \$13.00 per head greater net return than did calves on the ration of hay and concentrates.

In the second year steers outgained the heifers approximately 0.33 pounds per head per day. However, no difference was found between steers and heifers in dressing percentage and slaughter or carcass grade.

CHAPTER V

SUMMARY

Tests to study the value of winter pasture for wintering and finishing calves were started at four of the University of Tennessee experiment stations in the fall of 1949. These stations were located throughout the state; namely, Tobacco Experiment Station, Greeneville, Main Experiment Station, Knoxville, Middle Tennessee Experiment Station, Columbia and West Tennessee Experiment Station, Jackson.

Feeds used in these tests were winter pasture, permanent pasture, hay, silage and concentrates.

Under the conditions of these tests it cost approximately \$20 per acre to prepare and seed winter pasture.

Balbo rye, oats and ryegrass in combination with crimson clover was used successfully for winter pasture. The winter pasture had to be seeded early and growth made before cold weather in order to have sufficient growth for the winter season.

The carrying capacity of winter pasture depends on the amount of pasture grown in the fall and winter, the amount of concentrate fed to cattle on pasture, the size of the cattle used and the length of the grazing period desired.

In general, winter pasture produced calves that returned more per head, exclusive of pasture costs, than calves on comparable concentrate rations with silage and/or hay.

The feeding of concentrates on winter pasture proved profitable some years. This depended upon the price of concentrates and the amount of winter pasture available for the calves as well as spread in price between grades.

Good silage at one station produced calves that made more net profit than calves on winter pasture.

The unit of land required to produce enough winter pasture to winter one calf would produce enough corn and/or sorghum silage to winter several calves.

Rations with silage produced cattle that made a greater net return than did comparable rations with hay.

The rations tested did not provide over 5 pounds of concentrates daily and in most cases did not raise the initial slaughter grade of the calves. So in order to sell calves on the spring slaughter market it would be necessary to start with calves grading good to choice for slaughter, weighing approximately 450 pounds or more and having sufficient quality to produce choice carcasses.

The carcasses, produced by calves on practically all the rations were very acceptable to the meat trade.

All rations involving winter pasture, hay, silage and concentrates produced yearlings that made greater net returns than if they had been sold at weaning time.



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APPENDIX

TABLE VII

FEED PRICES

Station	Year	Silage per ton	Hay per ton	Concentrates per ton		
				3 C.C.M. (a) 1 C.S.M. (b)	1 C.C.M. (a) 1 C.S.M. (b)	3 G.S.C. (c) 1 C.S.M. (b)
T.E.S.	1949-50	\$7.50	\$20.00	\$49.60		
	1950-51	10.00	35.00	60.00		
	1951-52	10.00	30.00	60.00		
Main Station	1949-50		27.50			65.50
	1950-51		30.00			72.90
	1951-52		30.00			76.00
M.T.E.S.	1949-50	7.50	20.00	46.25	52.50	
	1950-51	10.00	40.00	53.80	63.20	
W.T.E.S.	1949-50	7.50	20.00	46.25	52.50	
	1950-51	10.00	30.00	57.50	65.00	
	1951-52	10.00	30.00	67.25	72.00	

(a) C.C.M. - corn cob meal.

(b) C.S.M. - cottonseed meal.

(c) G.S.C. - ground shelled corn.

TABLE VIII

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER PASTURE, SILAGE,
HAY AND CONCENTRATES FOR FATTENING OR WINTERING BEEF CALVESTobacco Experiment Station
1949-50

	1 Winter Pasture Hay	2 Winter Pasture Hay 5 lbs. Conc.	3 Permanent Pasture Hay 5 lbs. Conc.	4 Silage 2 lbs. Hay 5 lbs. Conc.
No. animals in lot	5	5	5	5
No. days on experiment	166	166	166	166
Av. initial wt., lbs.	469	465	464	471
Av. final wt.	751	768	722	742
Av. total gain	282	303	258	271
Av. daily gain	1.70	1.82	1.56	1.63
Av. daily feed:				
Hay	2.84	2.62	4.8	2.0
Silage				26.7
Concentrate		4.8	4.5	4.9
Pasture	ad lib	ad lib	ad lib	
Av. feed consumed per cwt. gain				
Hay	167	144	306	121
Silage				1635
Concentrate		261	289	301
Av. total feed cost per cwt. gain (a)	1.67	7.91	10.18	14.80
Av. total feed cost per head (a)	4.72	23.95	26.23	40.10
Av. initial cost	111.83	111.96	109.76	112.33
Av. total cost (a)	116.55	135.91	135.99	152.43
Av. initial feeder grade	HG-	HG	HG +	HG +
Av. initial slaughter grade	LG	HM	LG +	LG-
Av. percent shrink TES to Knox- ville	6.8	6.0	7.6	5.6
Av. dressing percent	59.2	59.4	56.6	57.0
Av. final slaughter grade	G	G	LG +	G-
Av. final carcass grade	G +	HG-	LG +	HG-
Av. selling price	26.35	26.26	25.55	25.99
Av. returns per head	197.89	201.68	184.47	192.84
Av. net returns per head (a)	81.34	65.77	48.48	40.42

(a) Exclusive of pasture cost.

TABLE IX

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER PASTURE, SILAGE,
HAY AND CONCENTRATES FOR FATTENING OR WINTERING BEEF CALVESTobacco Experiment Station
1950-51

	1	2	3	4
	Winter Pasture Hay	Winter Pasture Hay 5 lbs. Conc.	Permanent Pasture Hay 5 lbs. Conc.	Silage 2 lbs. Hay 5 lbs. Conc.
No. animals in lot	5	5	5	5
No. days on experiment	195	195	195	195
Av. initial wt., lbs.	473	460	474	477
Av. final wt.	686	735	745	744
Av. total gain	213	275	271	267
Av. daily gain	1.09	1.41	1.39	1.37
Av. daily feed:				
Hay	5.8	5.8	4.7	2.0
Silage				23.6
Concentrate		4.95	4.95	5.0
Pasture	ad lib	ad lib	ad lib	
Av. feed per cwt. gain				
Hay	527	414	341	146
Silage				1723
Concentrate		351	356	366
Av. total feed cost per cwt. gain(a)	8.76	17.44	16.53	22.00
Av. total feed cost per head (a)	18.70	47.89	44.79	58.74
Av. initial cost	125.09	120.62	127.89	130.79
Av. total cost (a)	143.79	168.51	172.68	189.53
Av. initial feeder grade	G +	G +	G +	HG -
Av. initial slaughter grade	LG	LG +	G -	G +
Av. percent shrink TES to Knoxville	10.9	9.0	6.4	8.1
Av. dressing percent	56.9	60.9	57.3	59.9
Av. final slaughter grade	HG +	G +	C -	C -
Av. final carcass grade	LG +	LC -	G	LC +
Av. selling price	33.02	34.95	34.64	34.55
Av. returns per head	226.59	256.82	258.19	257.06
Av. net returns per head (a)	82.80	88.31	85.51	67.53

(a) Exclusive of pasture cost.

TABLE X

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER PASTURE, SILAGE,
HAY AND CONCENTRATES FOR FATTENING OR WINTERING BEEF CALVESTobacco Experiment Station
1951-52

	1	2	3	4
	Winter Pasture Hay	Winter Pasture Hay 5 lbs. Conc.	Permanent Pasture Hay 5 lbs. Conc.	Silage 2 lbs. Hay 5 lbs. Conc.
No. animals in lot	6	6	5	5
No. days on experiment	196	196	196	196
Av. initial wt., lbs.	453	459	463	447
Av. final wt.	748	816	740	720
Av. total gain	295	357	277	273
Av. daily gain	1.50	1.82	1.41	1.39
Av. daily feed:				
Hay	2.2	2.8	4.1	2.0
Silage				21.0
Concentrate		4.8	4.8	4.9
Pasture	ad lib	ad lib	ad lib	
Av. feed per cwt. gain				
Hay	149	154	291	142
Silage				1508
Concentrate		264	336	355
Av. total feed cost per cwt.				
gain(a)	2.24	10.23	14.46	20.31
Av. total feed cost per head (a)	6.60	36.55	39.99	55.44
Av. initial cost	151.96	152.62	156.38	152.35
Av. total cost (a)	158.56	189.17	196.36	207.79
Av. initial feeder grade	G +	G +	HG	LC-
Av. initial slaughter grade	HG-	G +	HG +	HG +
Av. percent shrink TES to Knoxville	3.6	3.7	5.1	3.4
Av. dressing percent	58.9	60.4	56.7	56.5
Av. final slaughter grade	LC-	C-	LC-	HG
Av. final carcass grade	G-	G +	LG	G +
Av. selling price	30.93	31.05	29.41	31.35
Av. returns per head	231.27	253.34	217.66	225.84
Av. net returns per head (a)	72.71	64.17	21.30	18.05

(a) Exclusive of pasture cost.

TABLE XI

STATISTICAL ANALYSIS OF AVERAGE DAILY GAINS OF YEARLINGS

Tobacco Experiment Station
1949-50, 1950-51 and 1951-52

Source	d/f	S.S	M.S.	F.	P.
Total	61	4.54			
Year	2	1.36	.680	17.17	<.01
Treatment	3	.70	.233	5.88	<.01
Year x Treatment	6	.50	.0833	2.103	>.05
Within	50	1.98	.0396		

TABLE XII

STATISTICAL ANALYSIS OF DRESSING PERCENTS OF YEARLINGS

Tobacco Experiment Station
1949-50, 1950-51 and 1951-52

Source	d/f	S.S.	M.S.	F.	P.
Total	61	334.6			
Year	2	5.26	2.63		>.05
Treatment	3	91.46	30.5	8.09	<.01
Year x Treatment	6	49.18	8.2	2.18	>.05
Within	50	188.7	3.77		

TABLE XIII

STATISTICAL ANALYSIS OF FINAL SLAUGHTER GRADES OF YEARLINGS

Tobacco Experiment Station
1949-50, 1950-51 and 1951-52

Source	d/f	S.S.	M.S.	F.	P.
Total	61	210.4			
Year (a)	2	86.5	43.25	20.2	< .01
Treatment	3	9.5	3.17	1.48	> .05
Year x Treatment	6	7.4	1.23	-	-
Within	50	107	2.14		

(a) Analysis based on actual grades. Old method used first year and new grades second and third years.

TABLE XIV

STATISTICAL ANALYSIS OF CARCASS GRADES OF YEARLINGS

Tobacco Experiment Station
1949-50, 1950-51 and 1951-52

Source	d/f	S.S.	M.S.	F.	P.
Total	61	121.8			
Year (a)	2	8.2	4.1	3.01	> .05
Treatment	3	30.8	10.3	7.57	< .01
Year x Treatment	6	14.7	2.45	1.80	-
Within	50	68.1	1.36		

(a) Analysis based on actual grades. Old method used first year and new grades second and third years.

TABLE XV

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER PASTURE, HAY
AND CONCENTRATES FOR FATTENING OR WINTERING BEEF CALVES

Main Experiment Station
1949-50

	2 Winter Pasture Hay 5 lbs. Conc.	3 Hay 5 lbs. Conc
No. animals in lot	11	11
No. days on experiment	145	145
Av. initial wt., lbs.	476	480
Av. final wt.	774	665
Av. total gain	298	185
Av. daily gain	2.05	1.28
Av. daily feed:		
Hay	2.6	11.7
Concentrate	5	5
Pasture	ad lib	
Av. feed per cwt. gain		
Hay	125	914
Concentrate	244	391
Av. total feed cost per cwt. gain (a) . .	9.68	25.42
Av. total feed cost per head (a)	28.84	47.07
Av. initial cost	104.74	105.62
Av. total cost (a)	133.58	152.69
Av. initial feeder grade	LC-	LC
Av. selling price	26.50	24.86
Av. returns per head	205.11	165.42
Av. net returns per head (a)	71.53	12.73

(a) Exclusive of pasture cost.

TABLE XVI

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER PASTURE, HAY
AND CONCENTRATES FOR FATTENING OR WINTERING BEEF CALVES

Main Experiment Station
1950-51

	1 Winter Pasture Hay	2 Winter Pasture Hay 5 lbs. Conc.	3 Hay 5 lbs. Conc.
No. animals in lot	10	10	10
No. days on experiment	153	153	153
Av. initial wt., lbs.	498	494	495
Av. final wt.	640	676	675
Av. total gain	142	182	180
Av. daily gain . . . . .	.93	1.19	1.18
Av. daily feed:			
Hay	7.6	7.5	11
Concentrate		4.8	4.8
Pasture	ad lib	ad lib	
Av. feed per cwt. gain			
Hay	824	629	960
Concentrate		402	406
Av. total feed cost per cwt. gain(a)	12.36	24.11	29.25
Av. total feed cost per head (a)	17.54	43.94	52.73
Av. initial cost	149.34	148.32	148.38
Av. total cost (a)	166.88	192.26	201.11
Av. initial feeder grade	HG +	HG +	HG +
Av. initial slaughter grade	G +	G-	G-
Av. final slaughter grade	G +	HG +	HG +
Av. selling price	30.13	30.30	31.08
Av. returns per head	192.75	205.00	209.80
Av. net returns per head (a)	25.87	12.74	8.69

(a) Exclusive of pasture cost.

TABLE XVII

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER PASTURE, HAY
AND CONCENTRATES FOR FATTENING OR WINTERING BEEF CALVESMain Experiment Station
1951-52

	1 Winter Pasture Hay	2 Winter Pasture Hay 5 lbs. Conc.	3 Hay 5 lbs. Conc.
No. animals in lot	9	9	9
No. days on experiment	137	137	137
Av. initial wt., lbs.	485	480	486
Av. final wt.	736	769	713
Av. total gain	251	289	227
Av. daily gain	1.82	2.11	1.66
Av. daily feed:			
Hay	4.4	4.4	12.4
Concentrate		4.9	4.9
Pasture	ad lib	ad lib	
Av. feed per cwt. gain			
Hay	243	209	748
Concentrate		232	296
Av. total feed cost per cwt. gain (a)	3.64	11.96	22.48
Av. total feed cost per head (a)	9.12	34.57	51.02
Av. initial cost	174.60	172.80	174.96
Av. total cost (a)	183.72	207.37	225.98
Av. initial feeder grade	HG +	LC-	HG +
Av. initial slaughter grade	G +	G-	G +
Av. final slaughter grade	G +	HG-	G-
Av. selling price	30.77	31.81	31.18
Av. returns per head	226.34	244.71	222.36
Av. net returns per head (a)	42.62	37.34	-3.62

(a) Exclusive of pasture cost.

TABLE XVIII

STATISTICAL ANALYSIS OF AVERAGE DAILY GAINS
OF YEARLINGS IN LOTS 2 AND 3

Main Experiment Station
1949-50, 1950-51 and 1951-52

Source	d/f	S.S.	M.S.	F.	P.
Total	48	16.31			
Year	2	.56	.28	3.5	<.05
Treatment	1	2.28	2.28	28.5	<.01
Year x Treatment	2	10.01	5.0	62.5	<.01
Within	43	3.46	.080		

TABLE XIX

STATISTICAL ANALYSIS OF AVERAGE DAILY GAINS OF YEARLINGS

Main Experiment Station
1949-50 and 1950-51

Source	d/f	S.S.	M.S.	F.	P.
Total	50	10.71			
Year	1	6.63	6.63	105.2	<.01
Treatment	2	.74	.37	5.87	<.01
Year x Treatment	2	.49	.24	3.81	<.05
Within	45	2.85	.063		

TABLE XX

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER PASTURE, SILAGE,
HAY AND CONCENTRATES FOR FATTENING OR WINTERING BEEF CALVESMiddle Tennessee Experiment Station
1949-50

	1	2	3	4	5
	Winter Pasture Hay	Winter Pasture Hay 2.5 lbs. Conc.	Winter Pasture Hay 5 lbs. Conc.	Barn Silage 2 lbs. Hay 2.5 lbs. Conc.	Barn Silage 2 lbs. Hay 5 lbs. Conc.
No. animals in lot	6	6	6	6	5
No. days on experiment	182	182	182	182	182
Av. initial wt., lbs.	467	467	456	468	469
Av. final wt.	648	716	703	734	771
Av. total gain	181	249	247	266	301
Av. daily gain . . . . .	.99	1.37	1.36	1.46	1.66
Av. daily feed:					
Silage				20.6	17.7
Hay	2.7	2.0	2.3	2.0	2.0
Grain Mixture		1.92	3.73	2.48	4.96
Pasture	ad lib	ad lib	ad lib	-	-
Av. feed consumed per cwt. gain:					
Silage				1406	1069
Hay	275	147	166	138	122
Grain Mixture		140	275	168	299
Total feed cost per cwt. gain(a)	2.75	5.16	8.03	11.08	12.15
Total feed cost per head (a)	4.97	12.86	19.86	29.50	36.62
Av. initial cost	102.74	102.74	100.28	103.00	103.22
Av. total cost (a)	107.71	115.60	120.14	132.50	139.84
Av. initial feeder grade . . .	HG-	HG-	HG /	HG /	HG-
Av. initial slaughter grade . .	LG /	G-	LG-	G	G /
Av. percent shrink MTES to Nashville	2.1	2.9	2.6	0.7	0.99
Av. dressing percent	55.2	56.7	58.1	59.2	58.1
Av. final slaughter grade . . .	HM	LG-	G	G-	HG-
Av. final carcass grade	L Comp /	Comp /	Comp /	LG-	LG-
Av. selling price	25.92	26.46	27.17	27.00	27.60
Av. returns per head	164.22	184.40	186.04	197.06	211.01
Av. profit per head (a)	56.52	68.80	65.90	64.56	71.17

(a) Exclusive of pasture costs.

TABLE XXI

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER PASTURE, SILAGE,
HAY AND CONCENTRATES FOR FATTENING OR WINTERING BEEF CALVES

Middle Tennessee Experiment Station
1950-51

	1 Winter Pasture Hay	2 Winter Pasture Hay 2.5 lbs. Conc.	3 Winter Pasture Hay 5 lbs. Conc.	4 Barn Silage 2 lbs. Hay 2.5 lbs. Conc.	5 Barn Silage 2 lbs. Hay 5 lbs. Conc.
No. animals in lot	5	5	5	5	5
No. days on experiment	197	197	197	197	197
Av. initial wt., lbs.	453	445	449	457	448
Av. final wt.	720	761	737	798	786
Av. total gain	267	316	288	342	338
Av. daily gain	1.36	1.60	1.46	1.73	1.72
Av. daily feed:					
Hay	6.6	6.1	4.8	2.0	2.0
Silage				23.9	17.6
Concentrate		2.48	4.8	2.48	4.9
Pasture	ad lib	ad lib	ad lib	-	-
Av. feed per cwt. gain:					
Hay	486	381	388	114	117
Silage				1379	1026
Concentrate		154	332	143	284
Av. total feed cost per cwt. gain (a)	9.72	13.02	16.70	13.69	15.07
Av. total feed cost per head (a)	25.99	39.53	48.09	46.76	50.95
Av. initial cost	129.05	126.71	127.91	130.13	127.56
Av. total cost (a)	155.04	166.24	176.00	176.89	178.51
Av. initial feeder grade . .	G-	G	G ⁺	G ⁺	HG-
Av. initial slaughter grade .	LG-	LG ⁺	LG-	G-	G-
Av. percent shrink MTES to Nashville . .	.4	1.4	.9	1.5	3.7
Av. dressing percent	54	56.7	58.2	57.8	59.4
Av. final slaughter grade . .	H Com ⁺	G ⁺	HG-	HG ⁺	LC-
Av. final carcass grade . . .	LG-	G-	LCh-	C	C
Av. selling price per cwt. . .	31.15	32.46	33.23	33.65	33.95
Av. returns per head	223.34	243.44	242.56	264.45	256.97
Av. net returns per head (a)	68.30	77.20	66.56	87.56	78.46

(a) Exclusive of pasture cost.

TABLE XXII

STATISTICAL ANALYSIS OF AVERAGE DAILY GAINS OF YEARLINGS

Middle Tennessee Experiment Station
1949-50 and 1950-51

Source	d/f	S.S.	M.S.	F.	P.
Total	28	3.23			
Year	1	.69	.690	11.82	< .01
Treatment	4	1.32	.330	5.65	< .01
Year x Treatment	4	.11	.0275	.471	> .05
Within	19	1.11	.0584		

TABLE XXIII

STATISTICAL ANALYSIS OF DRESSING PERCENT OF YEARLINGS

Middle Tennessee Experiment Station
1949-50 and 1950-51

Source	d/f	S.S.	M.S.	F.	P.
Total	28	140.3			
Year	1	0	0		>.05
Treatment	4	37.0	9.25	1.74	>.05
Year x Treatment	4	2.6	.65	.123	>.05
Within	19	100.7	5.3		

TABLE XXIV

STATISTICAL ANALYSIS OF FINAL SLAUGHTER GRADES OF YEARLINGS

Middle Tennessee Experiment Station
1949-50 and 1950-51

Source	d/f	S.S.	M.S.	F.	P.
Total	28	57.1			
Year (a)	1	0	0	0	0
Treatment	4	21.10	5.28	2.80	<.05
Year x Treatment	4	1.40	.35	.192	>.05
Within	19	34.6	1.821		

(a) Analysis based on actual grades. Old method used first year and new grades second and third years.

TABLE XXV

STATISTICAL ANALYSIS OF CARCASS GRADES OF YEARLINGS

Middle Tennessee Experiment Station
1949-50 and 1950-51

Source	d/f	S.S.	M.S.	F.	P.
Total	28	57.9			
Year (a)	1	.9	.9	-	> .05
Treatment	4	32.5	8.125	6.35	< .01
Year x Treatment	4	.2	.05	-	> .05
Within	19	24.3	1.279		

(a) Analysis based on actual grades. Old method used first year and new grades second and third years.

TABLE XXVI

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER PASTURE,
SILAGE, HAY AND CONCENTRATES FOR FATTENING OR
WINTERING LIGHT BEEF CALVES

West Tennessee Experiment Station
1949-50

	4 Winter Pasture Hay 2.5 lbs. Conc.	5 Winter Pasture Hay	6 Winter Pasture Hay 2.5 lbs. Conc.	7 Silage 2.5 lbs. Conc.	8 Hay 2.5 lbs. Conc.	9 Silage 5 lbs. Conc.	10 Hay 5 lbs. Conc.
No. animals in lot	6	6	6	6	6	6	6
Av. initial wt., lbs.	466	464	463	465	454	468	464
Av. final wt.	640	629	665	604	552	639	613
Av. total gain	174	165	202	139	98	171	149
Av. daily gain	1.56	1.47	1.80	1.24	.87	1.53	1.33
Av. daily feed:							
Hay	3.28	4.38	.91		9.80		10.1
Silage				30.04		26.28	
Concentrate	2.5		2.21	2.5	2.5	5.0	5.0
Pasture	ad lib	ad lib	ad lib				
Av. feed per cwt. gain:							
Hay	211	297.8	50.4		1123		758
Silage				2421		1718	
Concentrate	160		122	202	288	327	375
Av. feed cost per cwt. gain (a)	6.42	3.06	3.84	14.57	18.97	14.15	16.42
Av. feed cost per head(a)	11.18	5.04	7.74	20.25	18.46	24.24	24.52
Av. initial cost . . .	102.59	102.15	101.97	102.41	100.06	103.03	102.08
Av. total cost (a) . .	113.78	107.19	109.70	122.66	118.53	127.27	126.60
Av. initial feeder grade	G-	G-	G-	LG /	G-	LG /	G-
Av. initial slaughter grade	Com	Com-	H Com	Com-	Com /	Com /	Com /
Av. final slaughter grade	Com-	Com-	H Com /	L Com /	1 Com /	Com-	L Com /
Necessary price to break even	17.76	17.03	16.48	20.29	21.44	19.91	20.65
Av. appraised price . .	23.50	24.00	24.00	23.50	24.00	23.50	23.50
Av. returns per head	150.40	150.96	159.60	141.94	132.48	150.16	144.05
Av. net returns per head (a)	36.62	43.77	49.90	19.28	13.95	22.90	17.46

(a) Exclusive of pasture costs.

TABLE XXVII

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER PASTURE,
SILAGE, HAY AND CONCENTRATES FOR FATTENING OR
WINTERING LIGHT BEEF CALVES

West Tennessee Experiment Station
1950-51

	4 Winter Pasture Hay 2.5 lbs. Conc.	5 Winter Pasture Hay	6 Winter Pasture Hay 2.5 lbs. Conc.	7 Silage 2.5 lbs. Conc.	8 Hay 2.5 lbs. Conc.	9 Silage 5 lbs. Conc.	10 Hay 5 lbs. Conc.
No. animals in lot	12	12	12	6	6	6	6
Av. initial wt., lbs.	452	451	451	452	440	452	451
Av. final wt.	513	490	534	566	539	589	572
Av. total gain	61	39	83	114	99	137	121
Av. daily gain . . . .	.55	.35	.75	1.03	.89	1.23	1.09
Av. daily feed:							
Hay	5	6.4	5	26	11	25.5	10.5
Silage				3.3		5.0	
Concentrate	2.5		2.5		3.3		5.0
Pasture	ad lib	ad lib	ad lib				
Av. feed per cwt.gain:							
Hay	904	1837	696		1245		968
Silage				2496		2076	
Concentrate	457		341	326	376	411	464
Av. feed cost per cwt. gain (a)	21.84	18.37	16.50	18.48	22.95	17.63	20.83
Av. feed cost per head (a)	13.38	7.12	13.56	21.00	22.64	24.07	25.10
Av. initial cost . . .	126.56	126.28	126.28	126.56	123.20	126.56	126.28
Av. total cost (a) . .	139.94	133.40	139.84	147.56	145.84	150.63	151.38
Av. initial feeder grade	G 4	G 4	G 4	G 4	G 4	G 4	G 4
Av. initial slaughter grade	H Com	Com 4	H Com-	H Com-	H Com-	H Com-	Com 4
Necessary price to break even	27.28	27.22	26.19	26.07	27.06	25.57	26.46
Av. appraised price . .	34.19	34.42	34.68	34.70	33.80	34.87	35.00
Av. returns per head	175.39	168.66	185.19	196.40	182.18	205.38	200.20
Av. net returns per head (a)	35.45	35.26	45.35	48.84	36.34	54.75	48.82

(a) Exclusive of pasture costs.

TABLE XXVIII

STATISTICAL ANALYSIS OF AVERAGE DAILY GAINS OF YEARLINGS IN
LOTS 4 THROUGH 10

West Tennessee Experiment Station
1949-50 and 1950-51

Source	d/f	S.S.	M.S.	F.	P.
Total	71	18.67			
Year	1	6.94	6.94	56.42	< .01
Treatment	6	2.43	.4050	3.29	< .01
Year x Treatment	6	2.16	.360	2.93	< .05
Within	58	7.14	.123		

TABLE XXIX

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER PASTURE,
SILAGE, HAY AND CONCENTRATES FOR FATTENING OR
WINTERING HEAVY BEEF CALVES

West Tennessee Experiment Station
1949-50

	1	2	3
	Winter Pasture Hay, 5 lbs. Conc. to Apr. 10 then P.P. and 10 lbs. Conc.	Silage, 5 lbs. Conc. to Apr. 10 and then Silage and 10 lbs. Conc.	Hay, 5 lbs. Conc. to Apr. 10 then Hay and 10 lbs. Conc.
No. animals in lot	6	6	5
No. days on experiment	175	175	175
Av. initial wt., lbs.	569	572	572
Av. final wt.	907	880	850
Av. total gain	336	308	278
Av. daily gain	1.92	1.76	1.59
Av. daily feed:			
Hay	2.17		12.4
Silage		32	
Concentrate	4.68	7.1	7.1
Pasture	ad lib		
Av. feed per cwt. gain:			
Hay	113		778
Silage		1817	
Concentrate	243	404	447
Av. total feed cost per cwt. gain (a)	6.82	16.26	18.25
Av. total feed cost per head(a)	22.94	49.96	50.69
Av. initial cost	126.24	125.84	125.84
Av. total cost (a)	149.18	175.80	176.53
Av. initial feeder grade	G	G	G
Av. initial slaughter grade	H Com ✓	Com ✓	H Com-
Av. percent shrink	2.1	3.3	2.7
Av. dressing percent	55.9	54.4	53.0
Av. final slaughter grade	LG ✓	LG ✓	LG-
Av. final carcass grade	Com ✓	H Com-	Com-
Av. selling price	28.00	27.92	27.50
Av. returns per head	248.67	237.63	227.71
Av. net returns per head (a)	99.49	61.83	51.18

(a) Exclusive of Pasture Costs.

TABLE XXX

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER PASTURE,
SILAGE, HAY AND CONCENTRATES FOR FATTENING OR
WINTERING HEAVY BEEF CALVES

West Tennessee Experiment Station
1950-51

	1 Winter Pasture Hay, 5 lbs. Conc. to Apr. 10 then P.P. and 10 lbs. Conc.	2 Silage, 5 lbs. Conc. to Apr. 10 and then Silage and 10 lbs. Conc.	3 Hay, 5 lbs. Conc. to Apr. 10 then Hay and 10 lbs. Conc.
No. animals in lot	12	5	6
No. days on experiment	168	168	168
Av. initial wt., lbs.	537	536	538
Av. final wt.	775	782	751
Av. total gain	238	246	213
Av. daily gain	1.42	1.46	1.27
Av. daily feed:			
Hay	5.5		11.6
Silage		31.2	
Concentrate	5.7	7.6	6.55
Pasture	ad lib		
Av. feed per cwt. gain:			
Hay	664.9		897
Silage		2130	
Concentrate	401.1	439	517
Av. total feed cost per cwt. gain (a)	12.20	18.52	21.38
Av. total feed cost per head (a)	29.07	45.55	45.50
Av. initial cost	150.31	149.97	150.55
Av. total cost (a)	179.38	195.52	196.05
Av. initial feeder grade . . .	G ⁷	HG-	HG-
Av. initial slaughter grade .	H Com ⁷	H Com ⁷	H Com ⁷
Av. percent shrink	3.2	2.9	2.8
Av. dressing percent	55.8	55.6	54.0
Av. final slaughter grade . .	IG ⁷	IG-	H Com-
Av. final carcass grade . . .	H Com ⁷	H Com-	Com ⁷
Av. selling price	30.23	29.51	28.79
Av. returns per head	226.91	223.90	210.07
Av. net returns per head (a) .	47.53	28.38	14.02

(a) Exclusive of pasture costs.

TABLE XXXI

RESULTS OF TESTS COMPARING RATIONS INVOLVING WINTER PASTURE,
SILAGE, HAY AND CONCENTRATES FOR FATTENING OR
WINTERING HEAVY BEEF CALVES

West Tennessee Experiment Station
1951-52

	1	2	3
	Winter Pasture Hay, 5 lbs. Conc. to Apr. 10 then P.P. and 10 lbs. Conc.	Silage, 5 lbs. Conc. to Apr. 10 and then Silage and 10 lbs. Conc.	Hay, 5 lbs. Conc. to Apr. 10 then Hay and 10 lbs. Conc.
No. animals in lot	12	6	6
No. days on experiment	168	168	168
Av. initial wt., lbs.	599	604	600
Av. final wt.	853	897	888
Av. total gain	254	293	288
Av. daily gain	1.51	1.74	1.71
Av. daily feed:			
Hay	2.85		15.31
Silage		34.43	
Concentrate	6.65	6.65	6.65
Pasture	ad lib		
Av. feed per cwt. gain:			
Hay	188		892
Silage		1972	
Concentrate	439	381	387
Av. total feed cost per cwt. gain (a)	15.12	20.53	24.23
Av. total feed cost per head (a)	38.47	60.21	69.87
Av. initial cost	194.67	196.30	195.00
Av. total cost (a)	233.14	256.51	264.87
Av. initial feeder grade	G-	G ⁺	HG-
Av. initial slaughter grade . .	H Com ⁺	G-	LG
Av. percent shrink	2.8	6.5	5.0
Av. dressing percent	57.9	54.9	56.7
Av. final carcass grade	H. Com ⁺	G-	LG
Av. selling price	30.00	32.00	31.00
Av. returns per head	248.70	268.48	261.64
Av. net returns per head (a) . .	15.56	11.97	-3.23

(a) Exclusive of pasture costs.

TABLE XXXII

STATISTICAL ANALYSIS OF AVERAGE DAILY GAINS OF YEARLINGS IN
LOTS 1 THROUGH 3

West Tennessee Experiment Station
1949-50, 1950-51 and 1951-52

Source	d/f	S.S.	M.S.	F.	P.
Total	51	3.33			
Year	2	.40	.20	3.57	< .05
Treatment	2	.13	.065	1.16	> .05
Year x Treatment	4	.40	.10	1.78	> .05
Within	43	2.40	.056		

TABLE XXXIII

STATISTICAL ANALYSIS OF DRESSING PERCENT OF YEARLINGS
IN LOTS 1 THROUGH 3

West Tennessee Experiment Station
1949-50, 1950-51 and 1951-52

Source	d/f	S.S.	M.S.	F.	P.
Total	51	218.2			
Year	2	61	30.5	19.18	<.01
Treatment	2	51.6	25.8	16.23	<.01
Year x Treatment	4	37.4	9.35	5.88	<.01
Within	43	68.2	1.59		

TABLE XXXIV

STATISTICAL ANALYSIS OF FINAL SLAUGHTER GRADES OF YEARLINGS
IN LOTS 1 THROUGH 3

West Tennessee Experiment Station
1949-50, 1950-51 and 1951-52

Source	d/f	S.S.	M.S.	F.	P.
Total	27	24.9			
Year (a)	1	2.3	2.3	2.65	> .05
Treatment	2	2.0	1.0	1.15	> .05
Year x Treatment	2	1.5	.75	-	> .05
Within	22	19.1	.868		

(a) Analysis based on actual grades. Old method used first year and new grades second and third years.

TABLE XXXV

STATISTICAL ANALYSIS OF CARCASS GRADES OF YEARLINGS IN
LOTS 1 THROUGH 3

West Tennessee Experiment Station
1949-50, 1950-51 and 1951-52

Source	d/f	S.S.	M.S.	F.	P.
Total	51	143.8			
Year (a)	2	37.3	18.6	8.65	<.01
Treatment	2	3.8	1.9	-	<.05
Year x Treatment	4	10.1	2.5	-	>.05
Within	43	92.6	2.15		

(a) Analysis based on actual grades. Old method used first year and new grades second and third years.