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Evaluations of systems for growing and finishing steers on pasture

Charles Milton Southall

To the Graduate Council:

I am submitting herewith a thesis written by Charles Milton Southall entitled "Evaluations of systems for growing and finishing steers on pasture." 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.

J.A. Corrick Jr, Major Professor

We have read this thesis and recommend its acceptance:

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(Original signatures are on file with official student records.)

August 27, 1973

To the Graduate Council:

I am submitting herewith a thesis written by Charles Milton Southall entitled "Evaluation of Systems for Growing and Finishing Steers on Pasture." 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 Science.

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We have read this thesis
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ABSTRACT

The purpose of this experiment was to evaluate systems of growing and finishing steers on pasture. The systems included a winter grazing phase, next a spring-summer grazing phase with supplemental feeding and finally a finishing phase.

During the winter, the steers grazed orchard grass or fescue pasture. As the pastures became short, a good quality mixed hay was fed ad lib. The spring-summer grazing phase consisted of four treatments. Treatment number 1 was the control treatment and received no supplementation during the spring-summer grazing phase. Steers on treatment 2 were supplemented at the rate of 1.0 lb. of corn per animal CWT from May 14 to August 30. Treatments 3 and 4 began supplementation on July 1 and ended on August 30. These cattle were supplemented at the rate of 0.5 lb. and 1.0 lb. of corn per animal CWT, respectively. Summer grazing was followed by a finishing phase in which half the steers that were formerly on fescue were fed outside and half were fed inside. Steers formerly on orchard grass were fed in a similar manner; half were fed inside and half outside.

Results of this study showed that gain, condition and fat thickness were significantly affected by supplemental feeding of grain on pasture. The effect of former pasture type and inside or outside feeding did not significantly affect gain, ADG or final fat thickness.

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CHAPTER I

INTRODUCTION

Beef production in the south, from the turn of the century through the 1920's, was dependent upon the abundance of high quality pasture produced in this area. Adequate rainfall, long growing seasons, and highly fertile soils combined with adapted grass and legume species account for this high quality pasture.

However, cattle finished on grass were two to three years old, weighed 1,200 to 1,400 pounds, and produced carcasses that would be too heavy for today's consumer. Yellow colored fat and dark colored muscle were also associated with "grass fat" cattle. Today the demand is for cattle weighing 1,000 to 1,100 pounds and grading high good to low choice with a minimum of external fat. Cattle grazed on pasture without supplementation will not have sufficient finish for a desirable carcass at the end of the summer grazing for today's market.

The purpose of this experiment was to examine total systems of growing and finishing steers which make maximum use of pasture forage with a minimum amount of grain. These systems included supplementation of steers grazing orchard grass-clover and fescue-clover pasture with grain at differing rates and varying periods of time during the spring-summer grazing phase.

For financial comparisons only ten similar steers were fed in drylot on a conventional growing and finishing ration until they reached approximately 10 mm. of back fat.

The objectives of this experiment were to:

1. Determine the effect of supplemental feeding of grazing steers on total gain, average daily gain (ADG), condition scores, and back fat thickness.

2. Determine the effect of supplemental feeding of grazing steers on subsequent performance of these steers in the feedlot.

3. Determine the effect of inside vs. outside feeding of these cattle during the finishing phase.

CHAPTER II

REVIEW OF LITERATURE

Much research has been done in the south on pasture grasses and legumes to increase beef production. Until recently, little work has been done on finishing steers on pasture with supplemental feeding. This review attempts to cover work that has been done on this subject.

I. ECONOMIC CONSIDERATIONS

Feeding of supplemental grain to grazing yearling steers has been shown by several authors to be financially advantageous. McClaugherty and Carter (1961) noted that relatively little grain is produced in the better grazing areas due to the rough topography and small proportion of cultivated land on most farms. The price of grain is higher than in surplus grain areas. Therefore, the amount of grain fed should be held to the minimum necessary to put desirable finish on the cattle. Malphrus et al. (1962) and Chapman et al. (1967) found that steers fattened more economically when part of the ration came from pasture. Haines et al. (1965) found that it was profitable to supplement yearling steers on pasture in the pre-feedlot year with a limited amount of a concentrate mixture. Hubbard et al. (1966) stated that feeding supplemental grain to grazing steers resulted in maximum utilization of quantities of forage, which was harvested by the animals, and smaller grain consumption than is required for cattle fed in a drylot.

Saunders et al. (1966) reported that farm feeding systems for finishing steers, which include combinations of grazing and drylot feeding or total grazing systems are likely to be more profitable than total drylot feeding systems. Grazing good and choice yearling feeder cattle on unsupplemented pasture offered only limited opportunity for profits, according to Goode et al. (1966), unless the cattle are finished in drylot at the end of the grazing season. Average daily gain of steers was higher ($P < .05$) than that of heifers. However, sex did not significantly affect length of grazing period, animal days per acre or gain per acre.

A study by Suman and Woods (1969) showed that steers fed corn beginning in July returned about $18 more than their designated costs; whereas, those fed corn season long returned approximately $50 over their designated costs.

Work at Northeast Louisiana Agricultural Experiment Station and Macon Ridge Branch Station, reported by Carpenter et al. (1968), showed that weanling beef steer calves could be economically fed on pasture until ready for slaughter. However, Utley et al. (1972) in a three-year study reported that steers which were managed to make maximum use of forage required an average of 155 days longer to reach similar market weights than steers fed higher energy rations. Feed costs per pound of gain for the two systems were almost identical. However, returns to captial, land, labor, and management were greater for the steers fed to make rapid gains and finish quickly due to seasonal trends in slaughter steer prices.

II. WINTER PHASE

Connell et al. (1948) and Peacock et al. (1964) stated that the subsequent summer gain of steers is inversely related to winter gains. Heinemann and Van Keuren (1956) have also shown that increased gain during the winter feeding period resulted in decreased gains during the grazing season. Launchbough (1957) reported a highly significant relationship between winter and summer gain; that is, the more a steer gained during the winter, the smaller the gain in the summer. Steers on the low nutritional winter ration gained more during the summer. However, these higher summer gains did not compensate for lower winter gains. Heinemann and Van Keuren (1957) also reported on different levels of winter nutrition. Subsequent gains on pasture were lowest for the high nutritional level and highest for the low nutritional level. However, the low nutritional level produced lighter market weights.

McCone (1958) suggested that wintering steer calves to gain 1.0 to 1.5 pounds per day would put the calves in a desirable condition for finishing on pasture the following summer. Duncan and Felts (1961) considered a winter gain of 81 pounds per head satisfactory for calves which were to be grazed the following summer. McClaugherty and Carter (1961) reported that calves fed grain or grass for October slaughter should gain about one pound per day during the winter. The authors stated that under most practical conditions the desired gain was made from a full feed of high quality roughage without additional grain.

Peacock et al. (1964) found that 0.77 pounds gain per day was required during the winter to maintain an animal's slaughter grade. This maintenance ration did not appear to affect skeletal growth, but resulted in a loss of condition. High et al. (1965a) reported that yearling steers wintered on orchard grass-ladino clover and fescue-ladino clover pastures plus hay, ad lib. gained about 1.25 pounds per head per day. Grazing days and beef gain per acre averaged higher on fescue-clover pasture fertilized with nitrogen, but the results were not consistent over the four years. Hay consumption by steers grazing the winter period on the orchard grass was significantly higher than on other treatments.

III. GRAZING PHASE

Higher gain on continuous, compared to rotational grazed pasture, may be attributed to different qualities of forage available for selecting grazing, as reported by Geus and Hart (1952). Selective grazing by the steers during the grazing season varied more on the rotational as compared to the continuously grazed pasture. Digestibility of the plant is reduced, reported Blaser et al. (1960), when more of the basal portion of the plant is consumed.

Sumen et al. (1964) concluded the following:

1. The number of head grazing must be such as to keep a tender, palatable growth.

2. The number of grazing animals per acre must be closely regulated during the period of rapid growth.

3. Tough, unpalatable growth, resulting primarily from feces

and urine spots will accumulate. This growth must be cut at least once during the grazing season.

The combinations of grass and legume mixtures has been studied by several researchers. Ronninger et al. (1955) found orchard grass-ladino clover and tall fescue-ladino clover mixtures superior to Kentucky bluegrass and white clover in grazing trials with yearling Hereford steers. However, by the end of the fifth year the average steer gains were virtually the same on all three mixtures.

Animals grazing tall fescue-clover mixtures had a lower average daily liveweight gain than those grazing other pasture reported Blaser et al. (1956). Animals, in this study, grazing grasses fertilized with nitrogen made lower daily gains than animals grazing the same grasses grown with ladino clover and not fertilized with nitrogen. Live weight gain per animal was lower when grazing tall fescue-ladino clover and tall fescue fertilized with nitrogen than for the comparable two treatments with orchard grass.

Heinemann and Van Keuren (1957) reported that cattle grazing pastures composed of grass-legume mixtures gained significantly faster than cattle grazing pastures composed of only grasses. In addition they found in 1958 that cattle fed grain on pasture and grazing orchard grass-alfalfa mixture used the grain more efficiently than those grazing grass pastures.

A mixture of ryegrass and crimson clover pasture could be substituted for all of the roughage and about 2/3 of the concentrate required for drylot feeding of yearling steers according to Baird and Sell (1956) and Godbey et al. (1959).

Duncan and Felts (1961) found that supplemental nitrogen fertilization of pastures resulted in increased forage, and increased grazing days and beef production ($P < .05$). Grazing days and beef yields were highest in the spring. Nitrogen fertilization plus irrigation increased the grazing days by 59 percent ($P < .01$) and the beef yields by 58 percent ($P < .01$) when compared to nitrogen alone but the extra gain did not pay for the extra cost. However, Hobbs et al. (1965) reported that it was unprofitable to apply 450 pounds of ammonium nitrate annually to straight fescue or straight orchard grass. They also suggested that the increase in beef production from the addition of 225 pounds of nitrogen annually to fescue-clover and orchard grass-clover pasture failed to pay the cost of application. Hobbs et al. (1965) further stated that clover was important in increasing steer gains. Orchard grass-clover pasture produced higher daily gains and higher grading cattle all year round than straight fescue, fescue-clover or straight orchard grass, all of which produced similar gains.

High et al. (1965b) reported similar results in that the rate of gain and grazing days were highest for orchard grass-clover and that beef gain per acre was significantly less on the fescue-clover.

However, Goode et al. (1966) found that when orchard grass-ladino clover and fescue-ladino clover mixtures were grazed continuously, they were of approximately equal value for growing steers. Difference in length of grazing period, animal days per acre, daily gain, gain per acre and slaughter grade were not significant.

In nitrate fertilization rates in Arkansas, Spooner and Ray (1966) found that daily steer gains were highest for the medium level of fertilization and lowest for the high level. The zero and low levels were intermediate, and produced similar gains. It was apparent in this study that a stocking rate above one steer per acre had a detrimental effect on forage quality. This was thought to be due to excessive trampling and manure droppings from the heavier stocking, which limited intake of the available forage by the steers. Edwards et al. (1968) reported that the slowest gains were made by cattle on fescue pasture receiving a limited amount of concentrate. Cattle given a limited amount of concentrate while grazing grass-legume pasture required the least quantity of concentrate per unit of gain. Burnes et al. (1970) at North Carolina reported that nitrogen fertilization of mountain pasture resulted in significant increases in animal days per acre, gain per acre and TDN per acre. However, reduced ADG was noted. Also associated with nitrogen fertilization was a very sharp reduction in the percent of white clover in the mixture. This, along with other factors, could account for the reduced animal performance.

Reid et al. (1955) stated that if a sufficient amount of herbage is available to satisfy the appetite for dry matter, it appears that, in the usual grazing practice, an adequate amount of digestible protein and TDN would be consumed by growing cattle and that corn could provide additional (or supplemental) energy, which is the primary limiting factor in the nutritive value of forage. The use of corn to

provide the energy, which is lacking in forage was also noted as being beneficial by Campton (1957).

Dowe et al. (1957) found that by feeding one-half-feed of grain on grass during a grazing season of 100 to 160 days followed by a full-feed period of 40 to 80 days resulted in a highly desirable carcass with a considerable savings of feed compared to the full-feeding of grazing cattle. This program also allowed the feeder to take advantage of the normally high fall slaughter prices.

McCone (1958) found that full-fed steers in drylot required 53 bushels of shelled corn per head to reach a desirable carcass grade. Those full-fed on pasture required 41 bushels while those fed only during the latter part of the grazing season required only 31 bushels. However, those cattle full-fed in drylot were ready for market 31 days earlier than those full-fed on pasture throughout the grazing season and 56 days earlier than those fed during the latter part of the grazing season.

According to Chapman et al. (1961) six pounds of a mixed feed having a crude protein content of 10 to 12 percent produced 2/3 pound more gain per day than did pasture alone.

Malphrus et al. (1962) found that steers on pasture consumed 180 pounds less feed per CWT of gain than steers in drylot during a three-year study.

Suman and Woods (1966) stated that little or no correlation was found between weight gains and protein; but when all feeds were considered from an energy standpoint, a high correlation (r = .936) with weight gains was noted. This means that as the energy level

increased the weight gains increased accordingly. Suman and Woods (1969) found that steers fed CSM in addition to the corn returned only $13 per acre over costs, whereas, steers fed corn throughout the grazing season returned $50 per acre.

Wise and Barrick (1967) reported on studies with feeding grain on pasture conducted over a period of 14 years. This work indicated that a level of 0.8 to 1 percent of the animals' body weight gave the greatest financial returns. Similar recommendations were given by Chapman et al. (1967) and Carpenter et al. (1971).

Wise et al. (1967) in a four-year study of 304 steers showed that nitrated Costal Bermuda grass may also be used in a "grain-on-pasture" program and that an extra source of protein was of questionable value. Suman and Woods (1969) also indicated that feeding protein supplements reduced total return per acre over designated cost compared to steers fed only a supplement corn. McClymont (1956) noted that a feature of most supplementary feeding experiments of grazing animals was that the growth responses were much less than would be expected on the basis of energy supplied by the supplements. In the winter of 1966, Moir et al. (1970) found that growth responses from the 20 percent and 35 percent protein supplements were in accord with the energy supplied whereas in 1967 only the 35 percent protein supplement produced the expected results. In the winter of 1967 marked body weight losses were experienced in unsupplemented cattle, indicating low pasture intake and as a consequence low protein intake. Under these conditions more protein may have been needed for utilization of additional energy.

In the spring of 1965 and 1967, growth responses from the 20 percent and 35 percent protein supplements were less than expected and pasture intake probably was reduced as a result of substitution of pasture by the supplement. In the spring of 1967, no growth response was found from the high protein supplement. These results are in accord with those of Holder (1962), who found that growth responses from supplement fed to grazing sheep were least when the sheep were gaining weight on pasture. Alexander et al. (1970) reported of 20 grazing experiments using yearling cattle under average seasonal conditions, no lasting benefit resulted from a urea-molasses supplement although a response was observed during the feeding period. In another experiment, using yearling cattle during a drought, the use of a ura-molasses supplement produced a lasting improvement in performance.

Perry et al. (1971) (Spring pasture) and Perry et al. (1972) (Spring plus summer pasture) reported similar results. Perry et al. (1971) found that cattle fed greater amounts of concentrates on pasture gains more rapidly ($r = 0.92$) and required a smaller area of pasture. Also the author found that gains during the drylot finishing period were negatively correlated ($r = -0.99$) with pasture gains. For each additional kilogram the cattle gained during the pasture season, the cattle gained 0.20 kilogram less on the same daily concentrate intake during the drylot finishing period.

Perry et al. (1972) in a study of feeding on spring plus summer pasture reported that increased concentrate feeding during the pasture phase resulted in linearly increased rate of gain ($r = 0.97$). Increased levels of feeding also resulted in greater carrying capacity of the pasture.

They also found that gains in the drylot finishing phase were negatively correlated (r = -0.96) with the previous gains during the pasture phase. For each additional kilogram the cattle had gained during the pasture phase, the gain was 0.29 kilogram less in the drylot phase.

The feeding of supplemental grain to grazing, yearling steers in order to produce good and choice carcasses has been reported by several authors. (Duncan, 1958; Heinemann and Van Keuren, 1958; Godbey et al., 1959; and Malphrus et al., 1962). Several other researchers have reported that cattle finished in drylot grade one-third of a grade higher than those fed grain while grazing, and those fed grain while grazing graded one-third of a grade higher than those on pasture alone (McCormick et al., 1958; Malphrus et al., 1962).

Bryant et al. (1965) finished two groups of steers in drylot after comparing the two groups on grazing alone and with grain-pasture combination. They found that the group fed grain on pasture graded one-third of a carcass grade higher than those on pasture alone.

In a similar experiment McClaugherty and Carter (1961) reported that final carcass grades were the same. This work was analogous to Black et al. (1940), who found that cattle fed grain on pasture but finished the last 56 days in drylot had more marbling and graded one-third of a grade higher than those held the entire period on pasture plus grain.

Hurt et al. (1953), Thomas et al. (1957), Duncan (1958), Godbey et al. (1959) reported that in comparisons of drylot, grain on pasture, and pasture alone no significant difference was found in the final grade.

IV. FINISHING PHASE

McClaugherty and Carter (1961) concluded that yearling steers fed 20 to 25 bushels of corn (or its equivalent in other concentrates) on pasture prior to finishing in drylot can be expected to reach the choice grade 60 days sooner than similar steers grazed on pasture without grain. Duncan and Felts (1961) reported that a short drylot feeding period of 70 days was desirable and profitable in producing good slaughter cattle for these yearlings after the grazing trials were concluded. High et al. (1965a) reported that a 75-day drylot period was profitable every year of a five year study following grazing. The condition scores and prices per hundred weight were raised every year.

High et al. (1965a) also found that steers that had previously grazed orchard grass averaged 12 days less in the feedlot than steers that had previously grazed fescue, and returned more dollars per head for the experiment. Hobbs et al. (1965) stated that no apparent relationship existed between the performance of cattle on pasture and their subsequent performance in the drylot. The drylot period increased returns per head in all treatments.

However, Suman and Woods (1966) reported that steers fed grain on pasture followed by a 56-day drylot period gained an average of 2.21 pounds per day. In only one year were the steers fat enough to grade high-good. This study showed a loss of $1.48 per steer.

Saunders et al. (1966) while studying alternative cattle feeding systems reported more profits from a combination of grazing winter annual and drylot feeding than grazing alone. Their most profitable

system included winter grazing of annual pastures for 120 days followed by a 120-day drylot feeding period.

Duncan and Felts (1961) reported that steer calves wintered in barns gained 27 pounds more and returned $5.47 more per head than calves subjected to cold weather, rain, and mud in outside lots on the same amount of feed. Calves wintered on orchard grass-bluegrass pasture gained as well as those wintered in barns. The pasture replaced about 40 percent of the hay requirement. Pund and Hogg (1968) stated that winter rations had little effect on subsequent feedlot performance.

Spooner and Ray (1972) found that steers finished on pasture gained faster than steers finished in drylots. Increasing grain during the early grazing phases resulted in increased gains and higher condition grades before finishing.

CHAPTER III

EXPERIMENTAL PROCEDURE

This study was conducted at The University of Tennessee Main Experiment Station, Blount Farm in Knoxville, Tennessee. Data were collected between November 11, 1971 and November 16, 1972.

I. EXPERIMENTAL DESIGN

The objective of this experiment was to evaluate different systems for growing and finishing steers for slaughter, which included three phases. The first was a wintering grazing phase when the animals were on pasture and were supplemented with a good quality mixed hay, free choice. Next, a spring-summer grazing phase in which there were four treatments, with two replications per treatment. One replication was orchard grass and clover, and the other was fescue and clover. Treatment 1 received no supplementation during the spring-summer grazing phase. Treatment 2 was supplemented at the rate of 1.0 lb. of corn per animal pounds per hundred weight (CWT) from May 15 to the end of the grazing phase. Treatment 3 received 0.5 lb. of corn per animal CWT from July 1 to the end of the grazing phase. Treatment 4 was fed 1.0 lb. of corn per animal CWT from July 1 to the end of the grazing phase. Finally, a finishing phase in which half the steers were finished inside barns and half were finished outside on pasture.

II. EXPERIMENTAL ANIMALS

Test Animals

Hereford, Angus and crossbred steers grading medium and good with an average weight of 552 pounds purchased in graded feeder calf sales in East Tennessee were used in this study. Thirty-six steers completed the experiment. One steer was found dead in the spring. Death was attributed to the steer apparently being struck by lightning. Three other steers were removed from the test because of illness.

"Put and Take" Animals

The animals for "put and take" were Hereford feeder heifers and steers averaging 450-550 pounds and grading medium and good. These animals were used to aid in maintaining the optimum height of the pasture for beef production.

A height of three inches for fescue and four to five inches for orchard grass was considered optimum for each of the species. The pastures were evaluated at two-week intervals to determine the number of "put and take" animals required.

III. MANAGEMENT

Experimental steers were weighed, sonorayed, condition scored, and sorted November 11, 1972. Forty steers were placed on pasture for wintering while ten steers were put in drylot and placed on a conventional growing-finishing ration. These ten steers were used for a comparison, only, and were not used in the statistical analysis.

Pastures

The pastures were five-acre plots of orchard grass-clover and fescue-clover, and were stocked at a rate of one test steer per acre. At two-week intervals throughout the spring-summer grazing phase pastures were evaluated to determine the percentage of grasses, legumes and weeds present. Average height, stage of growth, and general conditions of the pasture were also determined. These evaluations were used to determine the number of "put and take" animals needed on each plot.

The pasture compositions were as follows:

1. Treatment 1: Pasture 1--orchard grass-clover; Pasture 6--fescue-clover.

2. Treatment 2: Pasture 8--orchard grass-clover; Pasture 4--fescue-clover.

3. Treatment 3: Pasture 3--orchard grass-clover; Pasture 7--fescue-clover.

4. Treatment 4: Pasture 5--orchard grass-clover; Pasture 2--fescue clover.

A more detailed account of average pasture composition during the grazing phase can be found in Table XIV in the Appendix.

Wintering Phase

As the pastures became short the steers were fed a good quality mixed hay, free choice, winter hay feeding started January 10, 1972 and continued until April 12, 1972. It was the desire of the experimenter to maintain an average daily gain during the winter phase of approximately one pound per head. Hay consumption for the winter period is seen in Table V in the Appendix.

Grazing Phase

For about one month after the end of the winter period all grazing animals received pasture only. During the spring-summer phase treatments were as follows:

Treatment 1: Pastures 1 and 6--no grain during spring-summer grazing phase.

Treatment 2: Pastures 8 and 4--supplemented with grain at a rate of about 1.0 lb./an. CWT from May 15 to end of spring-summer grazing phase. Average grain consumed per head per day was 7.8 lbs.

Treatment 3: Pastures 3 and 7--supplemented with grain at a rate of about 0.5 lb. corn/an. CWT from July 1 to end of spring-summer grazing phase. During the spring-summer phase these steers received 4.1 lbs. of grain per head per day.

Treatment 4: Pastures 5 and 2--supplemented with grain at a rate of about 1.0 lb./an. CWT from July to end of spring-summer grazing phase. Steers in this treatment were supplemented at an average of 7.4 lb. of corn per head per day.

The amount of feed per animal was adjusted each weight period for weight gains. Grain consumed during the grazing phase can be found in Table V in the Appendix.

Finishing Phase

At the end of the summer grazing period the animals were put on a full feed of concentrate until they reached an average fat thickness of 10 mm. The finishing phase began August 31, 1972. Half of the steers that were formerly on orchard grass were fed in well-drained, outside lots; and the other half were fed inside. The same was done

for the steers formerly on fescue. All received a full feed of a commercial finishing ration. Its composition is seen in Table XV in the Appendix.

For comparison purposes, ten steers were placed in drylot on the Tennessee silage-finishing program which is as follows: the first 140 days, the steers were fed corn silage, free choice, plus six pounds of ground shelled corn per head per day. This was followed by a finishing phase when the animals were full fed a concentrate mixture of eight parts corn and one part cotton seed meal plus 3 lbs. of hay per day until they reached an average minimum fat thickness of 10 mm.

IV. COLLECTION OF DATA

Steers on Pasture

The initial and final weights were taken after the animals were shrunk over night. During the test the steers were weighed at 28-day intervals. Sonoray readings for fat thickness were taken at the beginning of the winter period and at the end of the grazing phase as well as during and at the end of the finishing phase. Condition scores were obtained at the beginning of the test and at the end of each phase.

Grazing days and beef production per acre were calculated as follows:

Grazing days per acre = (No. test an. per acre) + (No. put and take an. per acre) x (No. days grazed)

Beef production per acre = (Grazing days per acre) x (A.D.G. of test animals)

Beef gains per acre were calculated for each 28 days of the grazing period. Grazing days per acre and beef produced per acre are seen in Table XIX in the Appendix.

Steers in Drylot

Similar data were taken for steers in drylot. These data included an initial and final weight, initial and final condition score, and initial and final fat thickness. Packing company weight (live and carcass) were obtained. After a 48-hour chill period, the following carcass data were obtained: USDA quality grade, fat thickness, marbling score, dressing percent, rib eye area, conformation grade and percent kidney fat. Data from these steers were used only for comparison purpose and can be seen in Tables XVI and XVII in the Appendix.

V. STATISTICAL ANALYSIS

These data were analyzed by the method of least squares outlined by Harvey (1968). Unless otherwise stated, testing was at the conventional 5 percent level probability of chance occurrence ($P < .05$).

The analysis was based on the following models:

Winter Grazing Phase

$$Y_{ij} = \mu + p.t.j + e_{ij}$$

where, Y_{ij} = the observed value of given performance traits for winter phase,

μ = the mean

p.t. = the effect of the j^{th} pasture type

e_{ij} = the random error associated with the ij^{th} individual.

Spring-Summer Grazing Phase

$$Y_{ijk} = \mu + p.t._j + g_k + (p.t. \times g)_{jk} + e_{ijkl}$$

where, Y_{ijk} = the observed value of given performance traits for spring-summer phase,

μ = the mean

$p.t._j$ = the effect of the j^{th} pasture type

g_k = the effect of the k^{th} grain level

$(p.t. \times g)_{ik}$ = the interaction between pasture type and the grain level,

e_{ijkl} = the random error associated with the $ijkl^{th}$ individual.

Finishing Phase (Pasture Type x Grain)

$$Y_{ijk} = \mu + p.t._j + g_k + (p.t. \times g)_{jk} + e_{ijkl}$$

where, Y_{ijk} = the observed value of given performance traits for the finishing phase,

μ = the mean

$p.t._j$ = the effect of the j^{th} pasture type

g_k = the effect of the k^{th} grain level

$(p.t. \times g)_{ik}$ = the interaction between pasture type and the grain level,

e_{ijkl} = the random error associated with the $ijkl^{th}$ individual.

Finishing Phase (Pasture Type x Inside vs. Outside Feeding)

$$Y_{ijk} = \mu + p.t._j + \text{in. vs. out.}_k + (p.t. \times \text{in. vs. out.})_{jk} + e_{ijkl}$$

where, Y_{ijk} = the observed value of given performance traits for the finishing phase,

μ = the mean

p.t. = the effect of the j^{th} pasture type

in. vs. out.$_k$ = the effect of the k^{th} shelter type of finishing in barn or out on pasture,

(p.t. x in. vs. out.)$_{jk}$ = the interaction between pasture type and finishing in barn or out on pasture,

e_{ijkl} = the random error associated with the $ijkl^{th}$ individual.

CHAPTER IV

RESULTS AND DISCUSSION

In this study, the effect of pasture type, supplemental feeding and the interaction of these factors on the production of yearling steers and their subsequent performance in barns and outside on pasture during the finishing phase was examined and results are discussed herein. Overall means and standard deviations for selected variables are shown in Table I.

I. WINTER GRAZING PHASE

Total Gain

Average total gains of the steers grazing orchard grass-clover was slightly higher than of those grazing fescue-clover (Table II), however, the differences were not significant ($P > .05$) (Table III). Average gain of steers on each pasture for the winter phase is shown in Table IV.

Average Daily Gain

Steers grazing orchard grass-clover pasture during the winter phase had an average daily gain of 0.94 lb. compared to the 0.87 lb. average daily gain of steers grazing fescue-clover pasture (Table II). Although there was a trend for steers grazing orchard grass-clover to have a higher average daily gain, no significant difference ($P > .05$) was found in average daily gain due to pasture type (Table III). Average daily gains for each pasture are seen in Table IV.

TABLE I

OVERALL MEANS AND STANDARD DEVIATIONS FOR SELECTED VARIABLES

Variables	Mean	Standard Deviation
Number of animals	36	
Initial Observations		
Weight, lb.	552	±31.80
Fat thickness, mm.	2.30	± 0.77
Condition[a]	8.00	± 0.77
Performance Measurements		
Avg. daily gain, lb.		
Winter grazing	0.91	± 0.12
Spr.-Summer grazing	1.35	± 0.40
Winter + Spr.-Summer grazing	1.12	± 0.21
Finishing period	2.15	± 0.45
Overall	1.33	± 0.19
Weight, lb.		
End Winter grazing	692	±29.60
End Spr.-Summer grazing	880	±69.80
Final	1045	±77.60
Gain, lb.		
Winter	140	±19.30
Spr.-Summer	187	±55.90
Finishing	165	±34.70
Overall	493	±69.80
Fat thickness, mm.		
End Spr.-Summer grazing	4.9	± 2.15
Final	9.2	± 2.49
Condition[a]		
End Winter grazing	7.6	± 0.60
End Spr.-Summer grazing	7.7	± 1.26

[a]Condition scores: 6 = low medium, 7 = average medium, 8 = high medium, 9 = low good, and 10 = average good.

TABLE II

WINTER PERFORMANCE OF YEARLING STEERS ON ORCHARD GRASS-CLOVER AND FESCUE-CLOVER PASTURE

	Orchard Grass-Clover	Fescue-Clover
No. Animals	17	19
Weight, lbs.		
Initial	552	553
End Winter	698	687
Gain, lbs.	146	134
Avg. Daily Gain	0.94	0.87
Condition[a]		
Initial	8.0	8.1
End Winter	7.9	7.3

[a]Condition scores: 6 = low medium, 7 = average medium, 8 = high medium, 9 = low good, and 10 = average good.

TABLE III

ANALYSIS OF VARIANCE FOR THE EFFECTS OF PASTURE TYPE AND SUPPLEMENTAL GRAIN FEEDING ON WINTER GRAZING PHASE PERFORMANCE OF YEARLING STEERS

Source	df.	Mean Squares Winter Phase Gain	ADG	Condition
Pasture Type	1	1228.79	0.046	3.51***
Remainder	34	346.21	0.014	0.27

***$P < .001$.

TABLE IV

OVERALL PERFORMANCE OF YEARLING STEERS SUPPLEMENTED WITH GRAIN ON PASTURE

	1 Control (No Supplementation Spr.-Summer)		2 1.0 lb. Corn/CWT 5/15 - 8/30		3 0.5 lb. Corn/CWT 7/1 - 8/30		4 1.0 lb. Corn/CWT 7/1 - 8/30	
	Orchard Grass	Fescue	Orchard Grass	Fescue	Orchard Grass	Fescue	Orchard Grass	Fescue
Pasture Number	1	6	8	4	3	7	5	2
Weight, lb.								
Initial	533	550	558	554	561	557	546	550
End Winter	693	689	698	690	715	668	680	698
End Spr.-Summer	830	801	925	897	955	830	870	901
End Finishing	1011	984	1111	1023	1126	938	1025	1070
Fat Thickness, mm.								
Initial	2.0	2.6	2.0	2.4	2.4	2.5	2.3	1.8
End Spr.-Summer	3.7	2.6	6.2	6.8	7.0	4.0	4.8	3.8
End Finishing	9.0	7.0	10.4	11.0	11.4	7.3	7.8	9.2
Condition[a]								
Initial	7.7	8.2	8.4	8.2	8.2	8.0	7.5	7.8
End Winter	7.7	7.0	8.0	7.4	8.2	7.3	7.8	7.6
End Spr.-Summer	7.3	6.2	8.6	8.4	8.8	6.8	7.8	7.6

TABLE IV (continued)

	1 Control (No Supplementation Spr.-Summer)		2 1.0 lb. Corn/CWT 5/15 - 8/30		3 0.5 lb. Corn/CWT 7/1 - 8/30		4 1.0 lb. Corn/CWT 7/1 - 8/30	
	Orchard Grass	Fescue	Orchard Grass	Fescue	Orchard Grass	Fescue	Orchard Grass	Fescue
Gain, lb.								
Winter	160	139	140	136	154	111	134	148
Spr.-Summer	137	112	227	207	240	162	190	203
Finishing	181	183	186	126	171	108	155	169
Average Daily Gain, lb.								
Winter	1.03	0.90	0.90	0.88	0.99	0.73	0.86	0.96
Spr.-Summer	0.98	0.80	1.63	1.49	1.72	1.17	1.37	1.46
Finishing	2.36	2.37	2.42	1.64	2.22	2.00	2.01	2.20
Overall	1.29	1.17	1.48	1.26	1.52	1.15	1.29	1.40

[a]Condition scores: 6 = low medium, 7 = average medium and 8 = high medium.

Condition

At the end of the winter phase steers were scored for condition. The average condition scores for each pasture type is shown in Table II, page 26. The effect of type of pasture on condition was significant ($P < .001$) (Table III, page 26). Steers grazing orchard grass-clover had an average condition score of 7.94 while steers grazing fescue-clover had an average condition score of 7.32. While this is only a slight difference, individual condition scores within pasture type was very close and consistent. Average condition scores for each pasture can be seen in Table III.

Hay Consumption

During the winter phase steers were fed hay free choice. Hay consumption was similar for all groups (Table V).

II. SPRING-SUMMER GRAZING PHASE

Total Gain

Steers receiving supplemental feed during the spring-summer grazing season gained significantly more ($P < .001$) (Table VI) than steers not supplemented. Figures 1 and 2 illustrate the cumulative gains of treatments on the two pasture types. Total gains during the spring-summer of steers grazing fescue increased as rate of supplementation increased (Figure 1). Steers grazing pasture without supplementation gained satisfactorily until mid-July, from mid-July until the end of the grazing season they lost weight. Supplementation of steers with 0.5 lb. corn per CWT from July 1 to the end of the grazing phase

TABLE V

FEED SUMMARY

	1 Control (No Supplementation Spr.-Summer		2 1.0 lb. Corn/CWT 5/15 - 8/30		3 0.5 lb. Corn/CWT 7/1 - 8/30		4 1.0 lb. Corn/CWT 7/1 - 8/30	
	Orchard Grass	Fescue	Orchard Grass	Fescue	Orchard Grass	Fescue	Orchard Grass	Fescue
Pasture Number	1	6	8	4	3	7	5	2
Number of Animals	3	5	5	5	5	4	4	5
Winter Hay, lbs.								
Consumption/hd.	1366	1360	1380	1376	1376	1376	1374	1374
Consumption/hd./day	14.5	14.5	14.7	14.7	14.6	14.6	14.6	14.6
Spr.-Summer Supp., lbs.								
Consumption/hd.	-	-	819	819	250	250	452	452
Consumption/hd./day	-	-	7.8	7.8	4.1	4.1	7.4	7.4
Finishing Phase, lbs.								
Consumption/hd.	1459	1545	1441	1541	1441	1576	1503	1540
Consumption/hd./day	15.7	16.6	15.5	16.6	15.5	16.9	16.2	16.6

TABLE VI

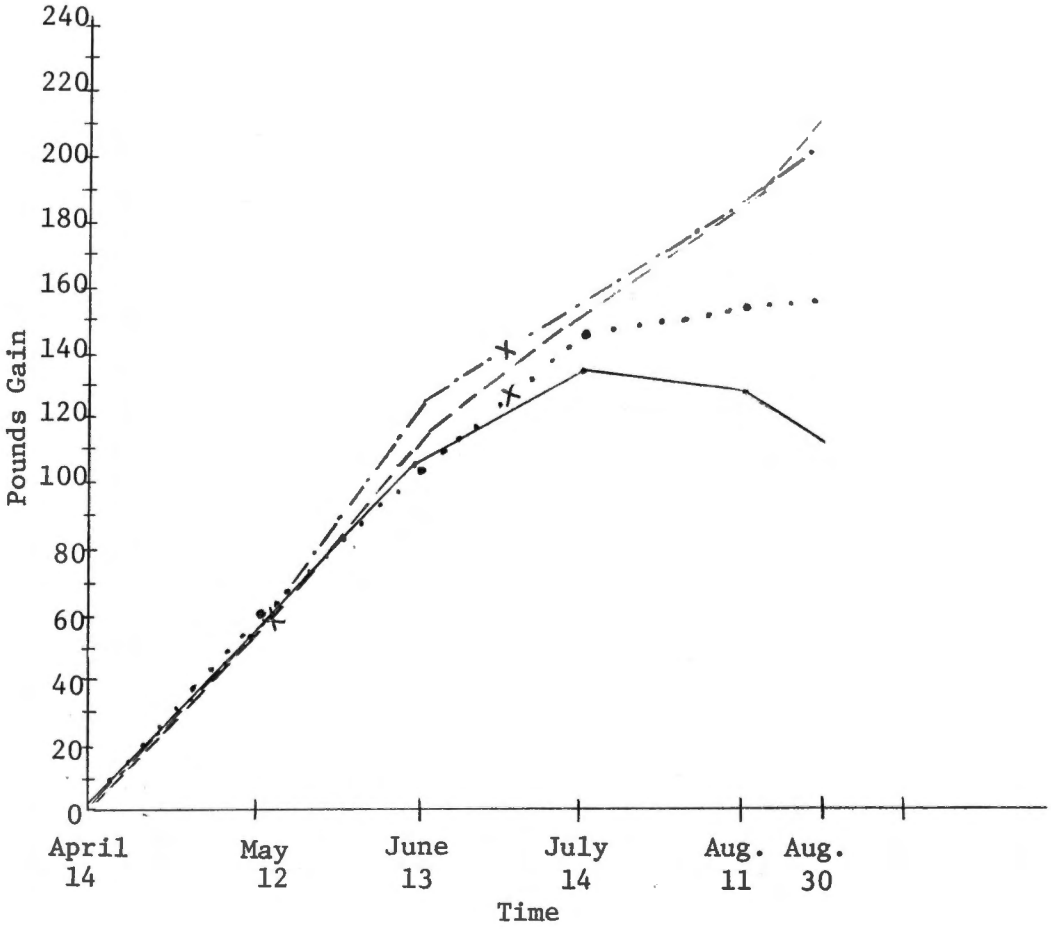
ANALYSIS OF VARIANCE FOR THE EFFECTS OF PASTURE TYPE AND SUPPLEMENTAL GRAIN FEEDING ON SPRING-SUMMER GRAZING PHASE PERFORMANCE OF YEARLING STEERS

Source	df.	Mean Squares Spring-Summer Phase			
		Gain	ADG	Cond.	F.T.
Pasture Type	1	6500.38	0.34	6.81*	10.64
Supplementation	3	13670.88***	0.71***	4.31*	18.50**
(Pasture Type) x (Supplementation)	3	3118.41	0.16	1.83	5.09
Remainder	28	1643.27	0.08	0.98	2.61

*P < .05.

**P < .01.

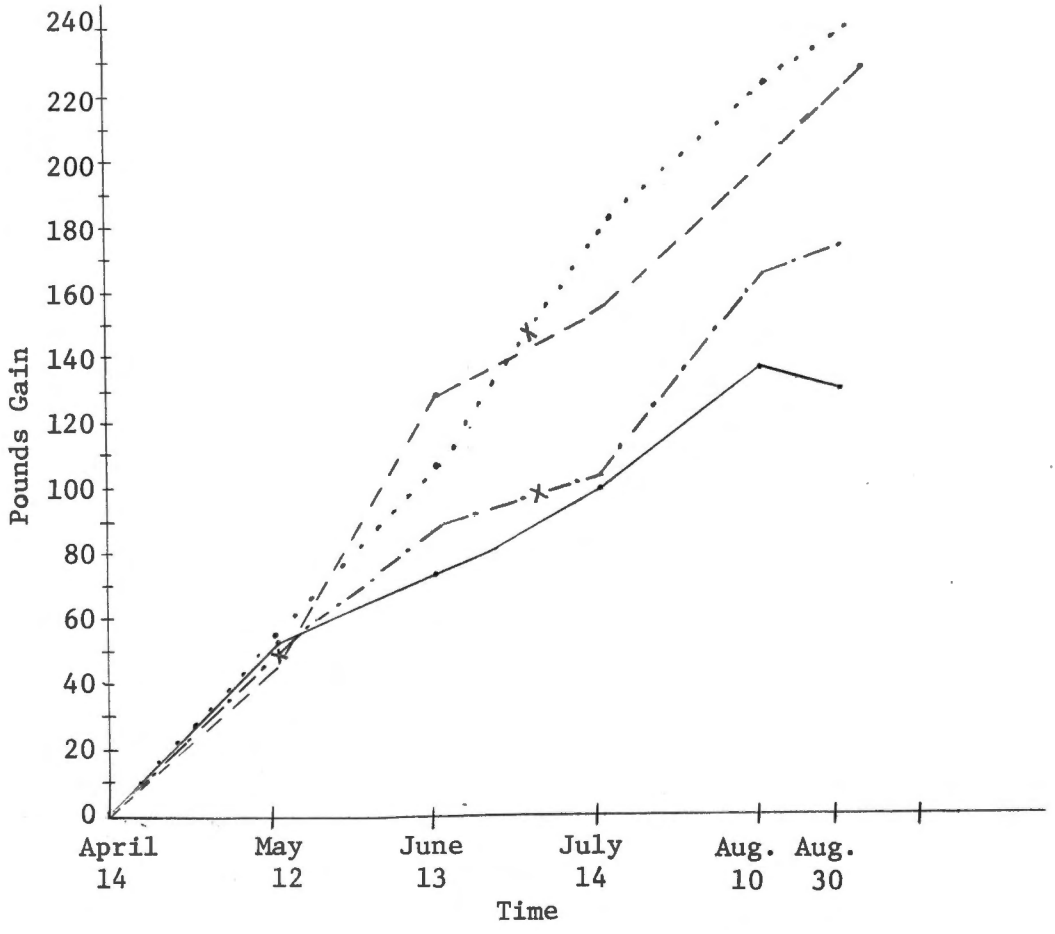
***P < .001.



Legend:

Control ————————————————————
1.0 lb. corn/cwt May 14-Aug. 30 — — — — — — — —
0.5 lb. corn/cwt July 1-Aug. 30 ----------
1.0 lb. corn/cwt July 1-Aug. 30 — · — · — · — · —
Corn supplementation started X

Figure 1. Cumulative gains of steers on fescue.



Legend:

Control ————————————————
1.0 lb. corn/cwt May 14-Aug. 30 - - - - - - - -
0.5 lb. corn/cwt July 1-Aug. 30 · · · · · · · · · ·
1.0 lb. corn/cwt July 1-Aug. 30 —·—·—·—
Corn supplementation started X

Figure 2. Cumulative gains of steers on orchardgrass.

increased gains until mid-July, subsequently gains decreased, and only body weight was maintained. Mid-summer gains of steers fed 1.0 lb. corn per CWT beginning in July was almost equal with those of steers receiving the same rate of corn (1.0 lb./CWT body weight) beginning in May.

It should be noted that all steers gained equally well until mid-July. At this time only the steers receiving supplemental grain and only those supplemented at the higher levels continued to gain. The quality of pasture available also seemed to have an effect on gains with clover percent being particularly important.

Figure 2 shows cumulative gains of steers on orchard grass. Cattle on the control pasture continued to gain until mid-August, then lost weight during the last period. Feeding 1.0 lb. of corn per CWT beginning mid-May, produced a high gain the first month with successive decreases each period thereafter. Steers fed 0.5 lb. corn per CWT starting in July continued their high rate of gain. This was the highest scoring pasture throughout the grazing season. Cattle supplemented with 1.0 lb. per CWT corn beginning in July gained slower than all other supplemented cattle. The importance of clover in combination with supplemental grain is seen here again.

Average Daily Gain

Supplemental grain feeding of grazing steers increased average daily gain ($P < .001$) (Table VI, page 31). Table IV (page 27) shows average daily gain for this phase. In as much as total gain is a function of average daily gain, factors affecting total gain also affect average daily gain.

Condition and Fat Thickness

Steers grazing orchard grass pastures had consistently higher condition scores ($P < .05$) (Table VI, page 31) than those grazing fescue. As percentage of clover increased, condition scores increased (Table VII). Cattle receiving no supplemental grain during the summer had the lowest average condition, while those receiving the grain over the longest period of time had the highest average condition scores. As the amount and length of time of supplemental feed increased, fat thickness increased ($P < .01$) (Table VI). One exception to this is Treatment 3 in which the higher percentage of clover had obvious effect on fat thickness. This emphasizes the importance of clover in pastures used for finishing cattle.

Feed Consumption

Rate of supplementation per animal was adjusted for weight gain each 28 days. Average consumption per head per day and total gain consumption for the spring-summer grazing phase are seen in Table V, page 30.

III. FINISHING PHASE

Pasture Type and Grain

Total gain and average daily gain. Pasture type and supplemental feeding did not significantly affect ($P > .05$) total gain or average daily gain for the finishing phase (Table VIII). Total gain and average daily gain for each treatment can be seen in Table III (page 26).

TABLE VII

SPRING-SUMMER GRAZING PERFORMANCE OF YEARLING STEERS SUPPLEMENTED WITH GRAIN ON PASTURE

	1 Control (No Supplementation Spr.-Summer)		2 1.0 lb. Corn/CWT 5/15 - 8/30		3 0.5 lb. Corn/CWT 7/1 - 8/30		4 1.0 lb. Corn/CWT 7/1 - 8/30	
	Orchard Grass	Fescue	Orchard Grass	Fescue	Orchard Grass	Fescue	Orchard Grass	Fescue
Pasture Number	1	6	8	4	3	7	5	2
Number of Animals	3	5	5	5	5	4	4	5
Weight, lb.								
End Winter Grazing	693	689	698	690	715	667	680	698
End Spr.-Summer Grazing	830	801	925	897	955	830	870	901
Average Daily Gain, lb. Spr.-Summer Grazing	0.98	0.80	1.63	1.49	1.72	1.17	1.36	1.46
Total Gain, lb. Spr.-Summer Grazing	137	112	227	207	240	162	190	203
Average % Clover Spr.-Summer Grazing	30%	3%	25%	25%	36%	5%	8%	11%

TABLE VIII

ANALYSIS OF VARIANCE FOR THE EFFECT OF PASTURE TYPE AND SUPPLEMENTAL GRAIN FEEDING ON FINISHING PHASE PERFORMANCE OF SLAUGHTER STEERS

Source	df.	Mean Squares Finish Phase		
		Gain	ADG Finish	Final F.T.
Pasture Type	1	2091.09	0.35	9.17
Grain	3	1067.25	0.18	12.70*
Pasture Type x Grain	3	2461.93	0.42	14.54*
Remainder	28	1021.26	0.17	4.31

*P < .05.

Final fat thickness. The interaction of pasture type and grain supplementation significantly affected final fat thickness ($P > .05$) (Table VIII). Final fat measurements were in accord with fat thicknesses at the end of the grazing phase; that is, the higher the fat measurement at the end of grazing the higher the final fat measurement (Table IX). However, increased fat deposition during the finishing phase was inversely related to fat thickness at end of grazing phase. Fat thickness increases for Treatments 1, 2, 3, and 4 were 4.9 mm., 3.2 mm., 3.8 mm., and 4.2 mm., respectively, during the finishing phase.

Pasture Type and Inside Feeding vs. Outside Feeding

Total gain and average gain. Type of previous pasture (orchard grass or fescue) or finishing inside barns or out in pasture did not significantly ($P > .05$) affect feedlot performance of steers (Table X). Table XI shows the performance of cattle fed inside vs. outside from each pasture type.

Final fat thickness. Cattle formerly on orchard grass had a higher fat thickness than cattle formerly on fescue. However, this difference was not significant ($P > .05$) (Table X).

Feed consumption. Feed consumption for the finishing phase is seen in Table V (page 30).

TABLE IX

PERFORMANCE OF YEARLING STEERS ON FOUR TREATMENTS

	Control No. Supp.	1.0 lb. corn 5/15 - 8/30	0.5 lb. corn 7/1 - 8/30	1.0 lb. corn 7/1 - 8/30
Weights, lb.				
Initial	542	556	559	548
End Winter	691	694	691	689
End Spr.-Summer	816	911	893	885
End Finishing	998	1067	1055	1047
Gain, lb.				
Winter	149	138	132	141
Spr.-Summer	125	217	202	196
Finishing	182	156	162	162
Overall	456	511	496	499
Avg. Daily Gain, lb/day				
Winter	0.96	0.88	0.86	0.91
Spr.-Summer	0.89	1.56	1.45	1.41
Finishing	2.37	2.03	2.11	2.10
Overall	1.23	1.37	1.34	1.35
Fat Thickness, mm.				
Initial	2.3	2.2	2.5	2.0
End Spr.-Summer	3.1	6.5	5.5	4.3
Final	8.0	10.7	9.3	8.5

TABLE X

ANALYSIS OF VARIANCE FOR THE EFFECT OF PASTURE TYPE AND INSIDE VS. OUTSIDE FEEDING ON FINISHING PHASE PERFORMANCE OF SLAUGHTER STEERS

Source	df.	Mean Squares Finish Phase (Pasture Type and In vs. Out) Gain	ADG Finish	Final F.T.
Pasture Type	1	1984.57	0.33	12.49
Shelter	1	480.08	0.08	5.01
Shelter x P.T.	1	4239.23	0.72	0.77
Remainder	32	1103.90	0.19	6.22

TABLE XI

PERFORMANCE OF STEERS FORMERLY ON ORCHARD GRASS AND FESCUE PASTURE AND FED INSIDE OR OUTSIDE DURING FINISHING PHASE

	Cattle Formerly on Orchard Grass		Cattle Formerly on Fescue	
	Fed Outside	Fed Inside	Fed Outside	Fed Inside
Total Gains	158	187	165	151
Avg. Daily Gain	2.1	2.4	2.1	2.0
Final F.T.	10.4	9.3	8.9	8.4

CHAPTER V

SUMMARY AND CONCLUSION

The objective of this experiment was to evaluate systems of growing and finishing steers on pasture. The systems included a winter grazing phase, a spring-summer grazing phase with supplemental feeding, and a finishing phase.

During the winter grazing phase the steers grazed orchard grass-clover or fescue-clover pasture. As the pasture became short, a good quality mixed hay was fed ad lib. The spring-summer grazing phase consisted of four treatments. In treatment 1 no supplemental feed was given. In treatment 2 supplemental feeding began May 14 and continued to August 30. Steers on this treatment were supplemented at a rate of 1.0 lb. of corn per animal CWT. Treatments 3 and 4 began supplementation on July 1 and ended August 30. These cattle were supplemented at the rate of 0.5 lb. and 1.0 lb. of corn per CWT, respectively.

Summer grazing was followed by a finishing phase in which half the steers that were formerly on fescue were fed outside and half were fed inside. Steers formerly on orchard grass were fed in a similar manner.

Results of this study showed that gain, condition and fat thickness were significantly ($P < .05$) affected by supplemental feeding of grain on pasture. Cummulative gain of steers on orchard grass and fescue pastures were plotted (Figures 1 and 2, pages 32 and 33,

respectively). It was concluded that supplemental feeding of grain to steers on pasture was effective only when pasture quality began to decrease in late summer. The supplementation at this time was only effective at the higher rate per animal.

Cumulative gains of steers on orchard grass were more eratic; however, the combined effect of both grain and percentage of clover present in these pastures probably accounted for this result.

For the finishing phase the interaction of pasture type and grain significantly affected the final fat thickness. Cattle grazing orchard grass pasture and receiving supplemental grain had consistently higher condition scores and fat thickness throughout the experiment. In the analysis of former pasture type and inside or outside feeding, gain, ADG, or final fat thickness were not significantly affected. It was concluded from this study that shelter was not required for cattle for the finishing phase in this geographic location during the late summer and fall.

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APPENDIX

APPENDIX

TABLE XII

FINANCIAL RETURNS FOR PASTURE STEERS FED SUPPLEMENTAL GRAIN DURING GRAZING PHASE AND FINISHED IN DRYLOT[a, b, c]

	1 Control (No Supplementation Spr.-Summer)		2 1.0 lb. Corn/CWT 5/15 - 8/30		3 0.5 lb. Corn/CWT 7/1 - 8/30		4 1.0 lb. Corn/CWT 7/1 - 8/30	
	Orchard Grass	Fescue	Orchard Grass	Fescue	Orchard Grass	Fescue	Orchard Grass	Fescue
Pasture Number	1	6	8	4	3	7	5	2
Number of Animals	3	5	5	5	5	4	4	5
Avg. Purchase Price Per Head, $	191.72	197.84	200.71	199.27	201.79	197.84	196.40	197.84
Avg. Selling Price Per Head, $	336.06	327.08	369.30	340.00	374.28	311.79	340.71	355.67
Avg. Feed Cost Per Head, $	88.77	91.66	110.87	114.31	95.23	100.02	102.87	104.18
Avg. Return Per Head Over Initial and Feedcost, $	55.57	37.58	57.72	26.41	77.26	13.93	41.44	53.65

[a]Days on test - 371. [b]Purchase price - $35.97/CWT. [c]Selling price - $33.24/CWT.

TABLE XIII

SUMMARY OF FEED COSTS, PER HEAD BASIS

	1 Control (No Supplementation Spr.-Summer)		2 1.0 lb. Corn/CWT 5/15 - 8/30		3 0.5 lb. Corn/CWT 7/1 - 8/30		4 1.0 lb. Corn/CWT 7/1 - 8/30	
	Orchard Grass	Fescue	Orchard Grass	Fescue	Orchard Grass	Fescue	Orchard Grass	Fescue
Pasture Number	1	6	8	4	3	7	5	2
Number of Animals	3	5	5	5	5	4	4	5
Winter Hay, $	37.02	36.86	37.40	37.29	37.29	37.29	37.24	37.24
Spr.-Summer Grain, $	-	-	22.36	22.36	6.83	6.83	12.32	12.32
Finishing Phase, $	51.75	54.80	51.11	54.66	51.11	55.90	53.31	54.62
Total, $	88.77	91.66	110.87	114.31	95.23	100.02	102.87	104.18

TABLE XIV

SUMMARY OF PASTURE COMPOSITION DURING SPRING-SUMMER GRAZING PHASE[a]

	1 Control (No Supplementation Spr.-Summer)		2 1.0 lb. Corn/CWT 5/15 - 8/30		3 0.5 lb. Corn/CWT 7/1 - 8/30		4 1.0 lb. Corn/CWT 7/1 - 8/30	
	Orchard Grass	Fescue	Orchard Grass	Fescue	Orchard Grass	Fescue	Orchard Grass	Fescue
Pasture Number	1	6	8	4	3	7	5	2
% Orchard Grass	63.0		70.0		58.0		79.0	
% Fescue		94.0		73.0		93.0		82.0
% Other Grasses	3.0		2.0				10.0	4.0
% Clover	30.0	3.0	25.0	25.0	36.0	5.0	8.0	11.0
% Weeds	4.0	3.0	3.0	2.0	6.0	2.0	3.0	3.0

[a]Percentages are average of three scoring dates--May 17, June 2 and July 10, 1972.

TABLE XV

COMPOSITION[a] OF RATION FED PASTURE STEERS DURING FINISHING PHASE

Ingredient	Percent of Ration
Corn, No. 2 Yellow	59.0
Cottonseed Meal (41% C.P.)	10.0
Cane Molasses	5.0
Dehydrated Alfalfa Meal (17% C.P.)	3.0
Animal Fat	2.0
Corn Cobs	20.0
Ground Limestone	0.5
Salt	0.5

[a]In addition to the ingredients listed, 1.5 million I.U. of Vitamin A per ton were added to the ration.

TABLE XVI

PERFORMANCE OF STEERS FED ON TENNESSEE SILAGE GROWING AND FINISHING PROGRAM[a]

	Pen Number	
	1	2
Weight, lb.		
Int.	508	505
End Roughage	767	787
Final	955	978
Gain, lb.		
Roughage Phase	259	282
Finishing Phase	188	191
Total	447	473
Fat Thickness, mm.		
Int.	1.6	1.4
End Roughage	6.2	5.4
Final	13.2	11.6
Avg. Daily Gain, lb.		
Roughage Phase	1.95	2.12
Finishing Phase	1.77	1.80
Overall	1.87	1.98

[a]Tennessee Silage Growing and Finish Program--141 days of silage ad lib. plus 6 lb. ground shelled corn, followed by a finishing phase of a full feed of a concentrate mixture of 8 parts corn and 1 part cottonseed meal plus 3 lb. hay per day until cattle reach an average fat thickness of 10 mm.

TABLE XVII

FINANCIAL RETURNS FOR STEERS FED ON TENNESSEE SILAGE GROWING AND FINISHING PROGRAM

	1	2
No. of Animals	5	5
Days on Test	239	239
Avg. Purchase Price per CWT., $	36.25	36.25
Avg. Purchase Price per Head, $	184.15	183.06
Avg. Selling Price per CWT., $	36.55	36.55
Avg. Selling Price per Head, $	349.05	357.46
Avg. Return per Head over Int. and Feed Costs, $	75.85	83.44

TABLE XVIII

SUMMARY OF CHANGE OF PUT AND TAKE ANIMALS DURING SPRING-SUMMER GRAZING PHASE

	5/5-5/19 No. An.	5/19-6/2 No. An.	6/2-6/30 No. An.	6/30-7/14[a] No. An.
Treatment 1				
Pasture 1	6	8	9	5
Pasture 6	4	6	6	4
Treatment 2				
Pasture 8	5	2	2	1
Pasture 4	5	6	6	4
Treatment 3				
Pasture 3	5	2	2	1
Pasture 7	4	6	6	4
Treatment 4				
Pasture 5	5	2	0	0
Pasture 2	5	7	8	5

[a]All put and take animals removed from pastures July 14.

TABLE XIX

SUMMARY OF PASTURE PRODUCTION

	1 Control (No Supplementation Spr.-Summer)		2 1.0 lb. Corn/CWT 5/15 - 8/30		3 0.5 lb. Corn/CWT 7/1 - 8/30		4 1.0 lb. Corn/CWT 7/1 - 8/30	
	Orchard Grass	Fescue	Orchard Grass	Fescue	Orchard Grass	Fescue	Orchard Grass	Fescue
Total Grazing Days/acre	366	368	329	371	329	368	315	385
Total Beef Produced/acre, lbs.	436	389	445	488	444	422	331	540

TABLE XX

FEED COST

	Price Per Pound
Urea--limestone treated corn silage	$0.00422
Ground Shelled Corn	0.02730
Cottonseed Meal	0.04470
Finishing Phase Ration	0.03547
Hay	0.02710

VITA

Charles Milton Southall was born in Tipton County, Tennessee on February 5, 1948. He attended Holmes Elementary School at Covington, Tennessee, and Byars-Hall High School at Covington, Tennessee, from which he graduated in 1966. He entered The University of Tennessee, Martin, in September 1966, graduating from there in June 1970. In January of 1971 he entered the Graduate School of The University of Tennessee, Knoxville. In December of 1973 he received the Master of Science degree with a major in Animal Science.

He was married to the former Sharon Elaine Snoderly of Alcoa, Tennessee on March 17, 1973.