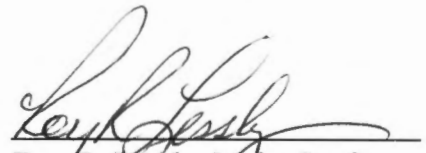


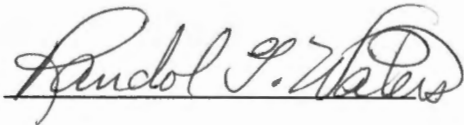
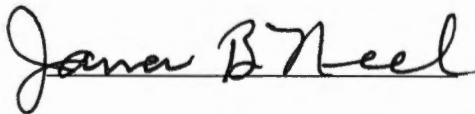
To the Graduate Council:

I am submitting herewith a thesis written by Ricky C. Skillington entitled "Selection criteria Used when Purchasing Bulls at the Senior Bull Performance Tested Bull Sale." I have examined the final copy of this thesis 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 Agriculture and Extension Education.



Roy R. Lessly, Major Professor

We have read this thesis
and recommend its acceptance:



Accepted for the Council:



Associate Vice Chancellor
and Dean of the Graduate School

Selection Criteria Used When
Purchasing Bulls at the Senior
Performance Tested Bull Sale

A Thesis
Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Ricky Charles Skillington

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ABSTRACT

The purpose of this study was to determine the selection criteria buyers use for purchasing performance tested bulls at the Senior Performance Tested Bull Sale conducted at the UT Central Bull Test Center. Various criteria were examined including: trait selection, perception of the effectiveness of the performance program, perception of the individuals purchasing bulls in relation to the buyer's demographic locations and buyer characteristics.

To facilitate the purpose of this study, the following specific objectives were developed:

1. To develop a profile of the personal and farm characteristics of producers who purchased performance tested bulls through the Senior Performance Tested Bull Sale.
2. To determine the most common selection criteria used by buyers when purchasing bulls and the relationship of those criteria to selected buyer demographic characteristics.
3. To determine buyers' perceptions of the level of satisfaction with the performance tested bull program and the relationship of those perceptions to selected buyer demographic characteristics.

This was a descriptive/correlational study which was Ex Post Facto in nature. Data collected using a researcher developed questionnaire. The questionnaire was field tested to determine content validity and reliability and appropriate adjustments were made prior to mailing to respondents.

Findings

The majority of respondents felt that the test records provided to them on the day of the sale were "useful." A large percentage of the respondents indicated their bulls were "productive breeders" and only a few experienced any calving problems with their bulls. Even fewer experienced any health problems with their purchased bull.

Most respondents were satisfied with the bull they purchased and the performance tested bull program. They responded positively to the question of whether they would buy from the sale again. It can be concluded that the overall satisfaction with the performance program is positive.

The dependent variables were four computed scale scores (descriptive information, general information, sale factors and performance information) based upon each respondents perceptions of the importance of various kinds of selection criteria. Scores for each set of factors were arranged in a Lickert-type scale ranging from one, being "very important" and four, being "very unimportant." The respondent had the opportunity to determine the degree of importance of each selection criterion.

Respondents rated the perceived importance of the various selection criteria provided to each potential buyer on sale day. The "descriptive" category received the highest rating while "disposition" was selected as the most important selection criterion within this category. "Performance information" followed as the next highest rated category. It should be noted that "milk EPD" was selected as the single most important selection criterion in this category. "General information" followed as the next highest rated category. The highest rated criterion in the entire study is found in this category. "Breed" is the criterion that received the highest rating. "Sale factors" was the lowest

rated of the categories with "reputation of sale" receiving the highest ranking criterion in this category.

There is no reason to conclude that there is a relationship between respondents' "level of education," "farming status," "method of marketing calves," "buyer's age," "size of operation," "number of years in beef business," or "buyers management of purchased bull" and their perceived importance of any of the four kinds of selection criteria provided to them about the bull.

Implications

The Senior Performance Tested Bull Sale has made an impact on the availability of genetically superior bulls in Tennessee. The selection criteria utilized by the responding individuals is the major strategy for selecting a superior bull. The data compiled in this study reveal that respondents' criteria for selecting bulls appears to be more of a descriptive nature rather than that of performance. It is apparent that the respondents, while interested in performance, indicated they do not fully understand the idea of performance information or that the phenotypic data is of more importance than the genetic data.

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CHAPTER I

INTRODUCTION AND PROBLEM

Introduction

The product known as beef is one of the most versatile and nutritious foods known to man. To provide the quantity and quality of this product desired by the consumer, improvements are needed in the beef animal.

Selection of proven animals is the most effective method of herd improvement. Sire selection alone can provide one-half of the genes for herd improvement since fifty percent of the genes in calves come from the sire, seventy-five percent come from the sire and the previous sire and eighty-five percent come from the last three sires (Minish & Fox, 1982).

The University of Tennessee has a long history of service to beef producers through the performance bull testing program. Starting in 1958, the University of Tennessee conducted a herd bull performance testing program. As part of this program, several different types of performance testing was conducted. Similar aged bulls were tested for different lengths of time. There were also differences in the testing due to the difference in the locations.

Need for the Study

Several studies have been completed on the bull performance testing program. Both the performance of the bulls in the testing program and the perceptions of producers who purchase the bulls have been studied. However, there were no studies found specifically related to only the Tennessee Senior Bull Sale conducted at the UT Central Bull Test Station and the buyers' perceptions of these bulls.

This study was to determine the buyers perceptions of the animals in the sale as well as their perceptions of the sale itself. This study was to determine if buyers perceived changes were needed in the sale. It also identified criteria used by buyers in selecting a bull at the Senior Performance Testing Program at the UT Central Bull Test Station. This study looked at only the Senior Performance Tested Bull Sale and the buyers who purchased bulls at this type of sale.

Purpose of the Study

The purpose of the study was to identify the criteria used by the producer in the selection of performance tested bulls. The study also determined the relationships between these criteria and selected buyer demographics.

The information obtained from this study determined if there was a relationship between the selection criteria and the results as perceived by the producer who purchased the bull. The selection criteria included the individual performance data of the bull as

well as the buyer's preference and the visual evaluation of the bull. These criteria allow the buyer to select bulls that will improve the performance of their herd.

The information obtained from the buyers will be useful to Extension professionals in planning educational programs for beef producers in counties where beef production is a major source of income. Assisting producers in increasing income from this agriculture enterprise is of foremost importance. Data will also be used to determine if recommendations are needed on improving the sale itself.

The specific objectives of the study were:

1. To develop a profile of the personal and farm characteristics of producers who purchased performance tested bulls through the Senior Performance Tested Bull Sale.
2. To determine most common selection criteria used by buyers when purchasing bulls and the relationship of those criteria to selected buyer demographic characteristics; and,
3. To determine buyers' perceptions of the level of satisfaction with the performance tested bull program and the relationship of those perceptions to selected buyer demographic characteristics.

Limitations of the Study

This study is limited to data collected from buyers of bulls from the Tennessee Senior Bull Performance Testing Program. All buyers were selected from those who purchased bulls during the five year period from 1991 through 1995. Only buyers with

complete addresses were used in the selection process. Also buyers who purchased bulls through a leasing program were eliminated prior to the selection. The number of surveys varied from county to county depending upon the number of beef producers who purchased bulls. Not every county in Tennessee had producers represented in this study. This study did not include buyers who purchased bulls from the Breeders Performance Testing Program or the Junior Bull Performance Testing Program.

Definition of Terms

The following terms are used in this study. These definitions are provided here in an effort to add understanding to the study.

Accuracy (ACC).-The degree of confidence placed in the EPD value. Higher accuracy means the data are more reliable and will change less with additional records.

Actual Birth Weight-The actual weight of the calf at birth.

Birth Weight EPD-A prediction of how future progeny of an animal can be expected to increase or decrease the calf size at birth compared to other animals in that breed. This value is an indicator of calving ease.

Breed-A group of animals that possess certain distinguishing characteristics and transmit these characteristics to their offspring with reasonable regularity.

Expected Progeny Difference (EPD)-A prediction of how future progeny of a sire are expected to perform for a particular trait in comparison to progeny of another sire of the same breed.

Frame-Size of the animal measured as "hip height" for age which can be scaled from 1-10. This scale is known as a Frame Score.

Milk EPD-A prediction of how future progeny of an animal can be expected to increase or decrease in pounds of milk production to other animals in that breed.

Pedigree-A lineage of ancestry on an animal.

Performance Test-Measure of an individual performance, over a standard given time frame.

Pelvic Area-A factor influencing the degree of calving difficulty.

Ribeye Area - Ultrasonic measurement of the animals ribeye muscle between the 12th and 13th rib reported in square inches.

Scrotal Circumference-The circumference measurement of testicles development of a bull; an indirect estimate of fertility usually presented in centimeters in terms of measurement.

Sire-Paternal parent of a calf.

Tennessee Beef Cattle Improvement Program (TBCIP)-A program where both purebred and commercial beef producers can create performance records that are uniform.

Breeders could use these records to increase the genetic worth of their herd.

Weaning Weight EPD-A prediction of how future progeny of an animal can be expected to increase or decrease weight in pounds at weaning compared to other animals in that breed.

Yearling Weight EPD-A prediction of how future progeny of an animal can be expected to increase or decrease weight in pounds at a year old compared to other animals in that breed.

CHAPTER II

REVIEW OF LITERATURE

Early History

The earliest example of mankind's urges to improve livestock through selection is not specifically known. Early selection was probably made with the Darwin theory of the survival of the fittest.

Wentworth (1923) stated that the first improver of beef cattle was an Englishman named Robert Bakewell. Working with the old longhorn stock of Central England, he was able to change the external form of cattle which, in turn, improved carcass quality. He selected animals with thickness in the loin, rib and quarter and for early maturity. Being a skilled anatomist, he mated related animals thus fixing these characteristics. As a result of his efforts his cattle became known all over England.

Because of Bakewell's work, three families set forth to develop a similar type of cattle. The Shorthorn breed was developed in England when the Colling Brothers and the Bates and Booth families followed Bakewell's selection methods. The Hereford breed was developed shortly thereafter by incorporating Bakewell's methods on another set of cattle found in England. The families involved with this breed's development were the Hewers, the Prices and the Thompkins (Wentworth, 1923).

Hugh Watson, in the northern part of Scotland, used some of the same principles in the decades to follow on the cattle of northern Scotland. His work laid the foundation for the Aberdeen Angus breed we know today (Wentworth, 1923).

The first cattle were brought to the Western Hemisphere by Christopher Columbus on his second voyage in 1493. These cattle, along with those brought by the Spanish in the 16th century, were introduced in Florida and Mexico. European settlers on the eastern coast of America also brought cattle as they settled the land. The crossing of the European cattle and the Spanish cattle led to the development of a new type of cattle in the New World (Williams, 1941).

During the war years in the last part of the eighteenth and first part of the nineteenth centuries, the cattle industry rapidly spread throughout the new world. As the cattle spread west, more crossing of the American breed with the old Spanish breed from Mexico occurred. This cross gave the cattle an appearance more similar to the old Spanish cattle but also gave them the ability to thrive on the lands of the West (Williams, 1941).

Following the Civil War, the cattle numbers in the Southwest became extremely large. However, since there were no markets in this area to sell these cattle, producers gathered large groups of cattle and herded them north to northeast, where cattle markets were located. These markets were usually located close to a railroad so transportation was made easily. At the peak, over 600,000 head of cattle were annually driven hundreds of miles to shipping points for transport to market (Williams, 1941).

In 1875, the invention of barbed wire started the demise of the big cattle drives. The severe winter of 1886-87 made beef producers realize that improvements in their

production methods must be made if the cattle business was to survive. The use of barbed wire allowed producers to separate their animals from other animals in the area. This allowed early beef producers a chance to not only improve the genetics of their cattle, but to make needed improvements in the lands that the cattle grazed (Williams, 1941).

Performance Testing in the United States

The need for beef cattle performance testing became very evident during the years after World War I. The first research was initiated by the United States Department of Agriculture in the early 1930's. This early testing was conducted at the United States Range Livestock Research Station located in Miles City, Montana. This early performance testing dealt with the weight gaining ability of certain breeds of cattle (Baker, 1967).

The first central bull test station was established in 1941, at Balmorhea, Texas. The purpose of this station dealt with the rate of gain of bulls compared to their counterparts in the same station. The performance of the cattle in this station was compared to the performance data gathered in the early days of this station. Because of the success of this station, additional stations and testing centers were established throughout the nation. In 1954, the Red Angus Association was founded and required performance data on each pedigree of the cattle registered (Baker, 1967).

During the 1950's, there was much interest in performance data of beef cattle throughout the nation. In 1955, the first Beef Cattle Improvement Association was

formed in the United States. This association was formed in Virginia with a purpose to provide a uniform on-farm testing program for Virginia beef producers (Baker, 1967).

Performance Testing in Tennessee

The Tennessee Beef Cattle Improvement Program was established in 1956. It was a joint project between the University of Tennessee Agricultural Extension Service, the University of Tennessee Agricultural Experiment Station and Tennessee beef producers. Its purpose was to provide beef producers a uniform on-farm testing program and help them collect data from the testing program and determine program results. This group also wanted to devise a method of testing bulls to be sold to other beef producers (Banks, 1981).

Steelman (1993) reported that the Tennessee Beef Cattle Improvement Program held its first performance tested bull sale in 1958. From 1958 until 1966, several performance bull sales were held throughout the state. The earliest data collected from this test program dealt with the animals' rate of gain, and simple performance gains.

From 1966 till 1972, performance tested bull sales were held in West Tennessee at the Ames Plantation Experiment Station. These early sales provided buyers with the bulls' rate of gain, as well as their pedigree information (McPeake, 1974).

In 1972, a central bull testing program was started by the Tennessee Agricultural Extension Service. The first set of bulls were fed together at the Anderson Farm in Brentwood, Tennessee. This farm was used since it had facilities to feed bulls in a central location and was located near sale facilities in Nashville. This effort was the start of the

Senior Bull Performance Tested program. This test program was later moved to the Middle Tennessee Experiment Station in Spring Hill, Tennessee. This program provided all bulls a common environment and made possible the elimination of some of the variables that had been present in other testing programs. (Steelman, 1993).

The physical environment and feed was uniform and each bull's progress was measured on the same set of scales. As the different breed associations improved their own performance data, EPD's were added to the performance data on the bulls in the senior bull sale. This allowed the potential buyers a chance to include birth weight, weaning weight, and yearling weight EPD's into the criteria for selection. After several years of using this data, the accuracy of the EPD's was increased. After research on scrotal circumference proved to be a source of valid information of fertility, these data were also gathered for producers to use for bull selection (Neel, 1996).

Bulls on the senior bull test program began at 7-10 months of age and lasted for 140 days. The program was later changed to a 112-day full feed test program in order to reduce the overall feed costs and reduce the amount of condition on the bull at the sale. While on test, each bull was owned by the producer who consigned it to the program. Bulls were screened by a committee and any bull that did not meet the minimum standards of performance set forth by the association were disposed of by either the consignor or the experiment station (Steelman, 1993).

Selection Criteria and Buyer Perceptions

Several studies have been conducted on the performance testing of bulls and buyer perceptions of these bulls.

Baker (1967) gave insight into the attitudes of cattlemen and their perceptions. He found that producers attitudes evolved through four periods. The first time period was when purebred cattle producers were established. The attitude then was to select sires for improving genetics within the individual herd. These improvements, while aimed at the individual herds, benefitted the total beef cattle population.

The second period increased the need for genetically improving livestock to increase the weight gain characteristics in order to market younger animals. The third period had producers looking for hard data for comparison of performance of individuals. Selecting animals by "weight per day of age" was very controversial due to the inability to prove this trait was related to performance. Due to the vast study of this trait, it has become a major factor in developing faster gaining and more efficient animals.

The fourth phase, according to Baker (1967), viewed the yield of trimmed retail cuts at a given age to be a very important trait. This trait, along with the rate of gain, is current in the beef industry today.

It was during these four periods that beef producers learned which characteristics were more highly heritable and which were not. As a result of the work done by Bakewell and others early beef producers knew that certain animals would pass on certain characteristics to their offspring. Data obtained by the breed associations put together pedigrees for the different animals. Through the work done at the early test stations, it

was determined that an animal's rate of gain was highly heritable. This early work proved that frame, muscle expression, and skeletal soundness were characteristics that were also highly heritable.

Additional work was done trying to relate these findings to being able to predict the accuracy of the heritability of selected traits. About that time it was determined that there was a relationship between small testicular size and fertility in bulls. When the national breed associations started to collect and process data on large numbers of registered animals, it became evident that bulls were able to pass on certain traits at a more accurate rate than others. With sufficient data, researchers learned they could predict the difference that could be expected in a calf from mating a certain bull to a particular cow. This was fine tuned due to the large number of calves with the data from the performance testing programs. This increased the accuracy of the Expected Progeny Difference, EPD.

Researchers later learned that many producers stayed away from certain bulls because of the problems associated with calving. After many years of research, it was learned that birth weight of calves could also be given an EPD value as well as rate of gain. A producer's attitude toward trait selection is perhaps one of the most important factors when selecting a breeding animal. The buyer's knowledge of heritable traits can vastly improve the related characteristics of the herd. Potential buyers continually place an emphasis on particular traits of a bull they are desiring to purchase. The order in which the potential buyer places these criteria plays a very important part in determining what the calf crop will look like and how they will perform.

Bryan (1972) found that buyers of performance tested bulls were interested in several different traits of the performance tested bulls. He found the buyers felt the most important data was the "performance" data provided in the catalog. Steelman (1993) found that buyers in his study were more interested in the "descriptive" category presented on the bulls in the performance tested program. He also found little relationship in buyer satisfaction and the variables dealing with Extension contacts, producer age or years in the cattle business.

A North Carolina study by Fouts (1987) included several different findings about buyer perceptions and selection criteria. One notable finding of his study was that an average of 73% of the buyers of performance tested bulls felt that the Agricultural Extension Service had influenced their decision to buy a bull from the tested bull sale in their state.

Cattlemen use many different criteria for selecting bulls. While more astute cattlemen may use several different criteria, all have their own ideas of what determines the best bull for their operation. Texas Tech University found during a survey study, that reproductive soundness was the most important trait used for selection. This study of more than 1000 producers, found commercial producers valued growth potential higher, while their counterparts in the purebred business rated structural correctness higher (Bible, 1993).

Rose (1994) found little difference in buyer perceptions of the importance of selection criteria in relationship to the type of producer, age of the producer, size of the operation, or the sale the buyer attended. He also found that producers in this study perceived a wide variety of criteria to be important in selection of the bull. In his study,

skeletal soundness, temperament and muscle expression were the top criteria; but there was little difference in the scores among the rankings of this study.

Steelman (1993) found there was no relationship between personal demographics of the purchasers of tested bulls and their selection of the bulls. However, he did find that a vast majority of the buyers would "recommend the sale to others," but only a little over half of those surveyed said that they "would definitely return" to other sales. He further found that a majority of respondents were satisfied with their purchase. A majority of the respondents also believed that the purchase would or did improve their beef herd genetically.

A similar study by McPeake (1994), found that the buyer's age seemed to have some impact on buyer satisfaction. He found that buyers from age 36 through 55 had the higher satisfaction level of those surveyed. In his study, the mean age of the buyer was 50.2.

Steelman (1993), also found that buyers in the Breeders Performance Tested Bull Sale had a high level of satisfaction with the sale and their purchase.

In summary, there has not been a study of the Senior Bull Testing Program without taking into consideration the other performance tested sales. The Senior Performance Tested Bull Sale attracts a somewhat different producer than the other types of performance tested programs. Producers attending the Senior Performance Tested Bull sale usually select the bulls that are a little older and those that will sire calves during the time of year that fit their production schedule. In the review of literature, there was no clear pattern regarding the buyers perceptions of the criteria they used in selecting the bulls that they purchased. This study focused only on the Senior Performance Tested

Bull sale and will identify the buyers personal and farm characteristics and the selection criteria used by the buyers in selecting their bulls.

CHAPTER III

PROCEDURES AND METHODOLOGY

Introduction

This is a descriptive/correlational study which is Ex Post Facto in nature. Data were collected using a researcher developed questionnaire.

Sample and Population

The sampling frame for this study was taken from the total list of 264 buyers who purchased performance tested bulls from the Senior Bull Sale at Middle Tennessee Experiment Station at Spring Hill, Tennessee. These buyers purchased bulls over a five year period from 1991 through 1995. The validated list of buyers was secured from the University of Tennessee Agriculture Extension Service Beef Cattle Breeding Specialist, Dr. David Kirkpatrick. Dr. Kirkpatrick is responsible for overseeing the performance bull sale.

Only Tennessee buyers were selected for this study. Producers who purchased bulls through a bull lease program were not included in the study. Any producer without a complete address was also deleted from the sampling frame. A sample size of 208 was used for this study.

Design

This is a descriptive/correlational study which is Ex Post Facto in nature with no control group being used in this survey. As such, there is no experimental design.

Instrumentation

The instrument used in this study was a modified version of the surveys developed by Kenneth Ambrose (1989) "1989 Performance Tested Bull Buyer Survey" and "Breeders Performance Tested Bull Sale Survey" developed by Bruce Steelman (1993). Changes were made to increase the reliability and usefulness of the instrument for this study.

The survey was checked by a panel of experts to validate the content validity. After making changes recommended by the committee, a pilot test was used to check the reliability of the instrument. Only minor revisions were made following the pilot test.

The questions in the instrument were a combination of nominally, ordinally and intervally scaled measures. The questionnaire was a mixture of closed-ended with unordered choices, closed-ended with ordered choices and open-ended questions. A Likert-type attitudinal scale was utilized in measuring some responses.

This survey was printed on standard white bond paper. A cover letter and a self-addressed stamped envelope were included with each survey mailed out. The cover letter in the first mailing included information about the intent of the study, the confidentiality

of the study responses and the sincere appreciation of the researcher for their assistance with the study.

The first mailing was to all 208 producers. Seventy-five questionnaires were returned as usable with thirteen found to be unusable(deceased, incorrect address or not interested in participation in study). A second mailing of 120 questionnaires was sent out with fifteen being returned as usable and five being found as unusable. On the third and final mailing of 100, nine questionnaires were returned as usable giving a total of 99 (47.6 percent) usable questionnaires which were used in the study.

Variable Descriptions

The first objective of this study was to develop a profile of the personal and farm characteristics of producers who purchased bulls through the Senior Performance Tested Bull Sale. The information gathered to meet this objective included: age, level of education, current farming status, years in cattle business, major source of farm income, number of breeding age cows, marketing method of calves, type of beef operation, acres of permanent pasture, use of rental pasture, placement of bull upon arrival to farm, purchase location, and distance from farm to purchase site. These were the independent variables of the study.

The second objective of the study was to determine the relationship between selection criteria importance levels and selected personal and farm characteristics. Selected characteristics consisted of: farming status, method of marketing calves, education level, age, size of beef operation, years in beef business, and buyer's

management practices when purchased bull arrived at the farm. The selection criteria importance levels were the dependent variables of this study.

The third objective of the study was to determine the buyer's perception of the senior performance tested bull sale and its relationship to selected buyer characteristics.

Data Analysis

The statistical analysis package used in this study was the Statistical Package for the Social Sciences (SPSS for Windows version 8.0.0). Frequencies, means, standard deviations, percentages, Pearsonian correlation coefficients, and multivariate analysis of variance (Manova) were used to describe the relationships in the objectives of this study.

CHAPTER IV

PRESENTATION AND DISCUSSION OF DATA

Introduction

Questionnaires were mailed to 208 individuals who purchased bulls from the Senior Bull Tested Bull Sale from 1991 through 1995. Of this total, 23 were returned due to incorrect mailing addresses, 18 were returned as unusable (person was deceased or not interested in completing the survey), while 99 were classified as usable responses. The total usable response rate was 48 percent of the initial mailing. An analysis of differences between early and late respondents failed to produce any substantive differences and since late respondents were considered to be similar to non-respondents (Goldhor, 1972), the researcher assumed that responses from this sample were generalizable to the population from which it was drawn.

The data were analyzed and organized according to the objectives of his study which are:

1. To develop a profile of the personal and farm characteristics of producers who purchased performance tested bulls through the Senior Performance Tested Bull Sale.
2. To determine most common selection criteria used by buyers when purchasing bulls and the relationship of those criteria to selected buyer demographic characteristics; and,

3. To determine buyers' perceptions of the level of satisfaction with the performance tested bull program and the relationship of those perceptions to selected buyer demographic characteristics.

Demographic Profile of Respondents

Objective number one was to develop a demographic profile of the individuals purchasing performance tested bulls. The data in the next four tables were used to develop this profile. The first table describes the general characteristics of the respondents.

All 99 of the respondents used in this profile were male. No females responded to the survey. As reported in Table I, 24 (24.2 percent) buyers were under 46 years of age, 28 (28.3 percent) were 46 to 55 years of age, 20 (20.2 percent) were 56 to 65 years of age and 27 (27.3 percent) were over 65 years old. Regarding their level of education, 10 (10.1 percent) received less than a high school education, 28 (28.3 percent) were high school graduates, 24 (24.2 percent) had completed some college or technical training and 37 (37.4 percent) were college graduates.

Forty-seven (47.5 percent) characterized themselves as full-time farmers, while 41 (41.4 percent) stated that they were part-time farmers and 11 (11.1 percent) considered themselves as retired. Looking at years in the beef cattle business, 25 (25.2 percent) had been in the business for less than 20 years, 37 (37.4 percent) from 20 to 30 years and 37 (37.4 percent) for over 30 years.

TABLE I: Personal and Farm Operation Characteristics of Selected Tennessee Senior Performance Tested Bull Buyers

Characteristics	Buyers	
	Number	Percent
Age		
Under 46	24	24.2
46 to 55	28	28.3
56 to 65	20	20.2
Over 65	27	27.3
Total	99	100.0
$\bar{x}=55.70$ S.D.=13.04		
Level Of Education		
Less than High School	10	10.1
High School Graduate	28	28.3
Some College or Trade School	24	24.2
College Graduate	37	37.4
Total	99	100.0
Current Farming Status		
Full-time	47	47.5
Part-time	41	41.4
Retired	11	11.1
Total	99	100.0
Years in Cattle Business		
Under 20 years	25	25.2
20 to 30 years	37	37.4
Over 30 years	37	37.4
Total	99	100.0
$\bar{x}=28.70$ S.D.=12.29		
Major Source of Farm Income		
Beef	80	80.8
Row Crops	10	10.1
Other	9	9.1
Total	99	100.0

TABLE 1. (Continued)

Characteristics	Buyers	
	Number	Percent
Number of Breeding age Beef Cows		
Under 50	28	28.3
50 to 100	36	36.3
Over 100	35	35.4
Total	99	100.0
$\bar{x}$ =106.91 S.D.=87.80		
Market Majority of calves		
Auction	57	57.6
Feeder Calf Sale	22	22.2
Direct Off Farm	13	13.1
Other	7	7.1
Total	99	100.0
Type of Beef Operation		
Cow/calf Sell at Weaning	76	76.8
Cow/calf Retained Ownership	29	29.3
Cow/calf Custom Feeding	4	4.0
Total	109*	100.3*
Acres of Permanent Pasture		
Less than 150	32	32.3
150 to 400	49	49.5
Over 400	18	18.2
Total	99	100.0
$\bar{x}$ =290.11 S.D.=320.57		
Use Rental Pasture		
Yes	37	37.4
No	62	62.6
Total	99	100.0
Placement of Bull Upon Arrival to Farm		
Turned in with Cows	18	18.2
Isolated in Pen	65	65.7
Penned with other Bulls	14	14.1
Other	2	2.0
Total	99	100.0

TABLE 1. (Continued)

Characteristics	Buyers	
	Number	Percent
Location Purchased Most Recent Bull		
Test Station	89	89.9
Video Site	10	10.1
Total	99	100.0
Distance from Farm to Purchase Site		
Under 51 Miles	38	38.4
51 to 100 Miles	33	33.3
Over 100 Miles	28	28.3
Total	99	100.0

*Numbers greater than number of respondents due to multiple responses.

Their beef enterprise was considered to be the main source of farm income for 80 (80.8 percent) respondents while row crop production was the main source of farm income for 10 (10.1 percent), and 9 (9.1 percent) had other enterprises.

When looking at the size of the operation, 28 (28.3 percent) said that their herd size was under 50 cows, while 36 (36.3 percent) had from 50 to 100 cows and 35 (35.4 percent) had over 100 cows in the herd. Fifty-seven (57.6 percent) respondents stated that they marketed a majority of their calves through an auction system, while 22 (22.2 percent) used feeder calf sales, 13 (13.1 percent) used the direct off farm sale, and 7 (7.1 percent) used other means to market calves.

Seventy-six (76.8 percent) considered their operation a cow/calf sell at weaning while 29 (29.3 percent) retained ownership and 4 (4.0 percent) did custom feeding. Thirty-two (32.3 percent) respondents owned less than 150 acres of permanent pasture, while 49 (49.5 percent) owned between 150 and 400 acres, and 18 (18.2 percent) owned more than 400 acres. Thirty-seven (37.4 percent) stated that they used rented pasture while 62 (62.6 percent) used no rented pasture in their operation.

When respondents were asked about the placement of the purchased bull upon arrival at the farm, 18 (18.2 percent) stated that they turned it out with the cows, 65 (65.7 percent) isolated it in a pen by itself. Fourteen (14.1 percent) penned it with other bulls and 2 (2.0 percent) placed the bull in places other than those mentioned.

Respondents could have purchased bulls by either attending the sale itself or through a video hook-up, 89 (89.9 percent) attended the sale itself and 10 (10.1 percent) purchased bulls at the video site. Thirty-eight (38.4 percent) traveled less than 51 miles

to the purchase site, while 33 (33.3 percent) traveled from 51 to 100 miles and 28 (28.3 percent) traveled over 100 miles to the site to purchase a bull.

Respondents were asked to identify sources from which they received information about the sale. As reported in Table II, the vast majority (81.1 percent) indicated they received information from catalogs sent to them by Extension specialists. However, other frequently sighted sources included "Extension Newsletters" (56.6 percent), "commercial magazines" (41.4 percent), and "Extension News Articles" (41.4 percent). Additional sources of information are also reported in Table II.

Respondents were asked specific questions regarding their perceived satisfaction with the Senior Performance Tested Bull Sale. Table III reports their answers to some of those questions. As reported in Table III, 97 (98.0 percent) indicated that they felt that performance records were important and 94 (94.9 percent) found the information in the catalog useful. Only 24 (24.5 percent) experienced any health problems and 89 (89.9 percent) found the purchased bull to be a productive breeder, while only 19 (19.2 percent) experienced calving problems with the purchased bull.

When asked whether the bull(s) contributed to the genetic improvement, 84 (85.7 percent) buyers reported that it did, and 91 (93.8 percent) indicated that they would purchase from the Senior Performance Tested Bull Sale again.

Table IV reports the perceived importance of selected criteria used by buyers on sale day. The criteria were categorized into four groups on respondents' surveys and they were asked to rate each criterion's importance in making a bull selection by rating it from "1" (very important) to "4" (very unimportant). These groups included; descriptive information, performance information, general information and sale factors. The

TABLE II. Sources From Which Buyers Received Information About the Senior Performance Tested Bull Sale

Source	Number*	Percent
Extension News Article	41	41.4
Extension Radio Program	4	4.1
Extension Newsletter	56	56.6
Extension Meeting	21	21.4
Visit from Extension Agent	15	15.2
Visit to Extension Office	11	11.2
Phone call to Extension Office	17	17.3
Phone call from Extension Office	11	11.1
Catalog from Extension Specialist	81	81.8
Commercial Magazine	41	41.4
Other	8	8.1

*Number indicates the number of respondents listing an item as a source of information about the sale.

TABLE III. Buyers' Perceptions of the Senior Performance Tested Bull Sale

Variable	Respondents	
	Number*	Percent
Are Performance Records Important?		
Yes	97	98.0
No	2	2.0
Total	99	100.0
Was Information in Catalog Useful?		
Yes	94	94.9
No	5	5.1
Total	99	100.0
Did You Experience any Health Problems with Bull(s)?		
Yes	24	24.5
No	74	75.5
Total	98	100.0
Was Purchased Bull a Productive Breeder?		
Yes	89	89.9
No	10	10.1
Total	99	100.0
Experienced Calving Problems with Purchased Bull(s)?		
Yes	19	19.2
No	80	80.8
Total	99	100.0
Did Bull(s) Contribute to Genetic Development?		
Yes	84	85.7
No	14	14.3
Total	98	100.0
Would you Purchase again from Tested Bull Sale?		
Yes	91	93.8
No	6	6.2
Total	97	100.0

*All totals do not sum to 99 due to non-response by all respondents.

TABLE IV. Buyers' Perceived Importance of Selection Criteria

Selection Criteria	Number*	$\bar{x}$	S.D.
Descriptive Information			
Age	99	1.41	.53
Disposition	99	1.18	.39
Frame Score	99	1.29	.46
Scrotal Circumference	98	1.41	.53
Fat Thickness	98	1.68	.58
Visual Appearance	98	1.32	.51
Ribeye Area	98	1.63	.63
Pelvic Area	98	1.53	.72
Computed Score	98	1.43	.32
Performance Information			
Adj. 205 day Wt.	98	1.61	.65
112 Day ADG.	98	1.62	.67
Adj. 365 day Wt.	97	1.69	.64
Wt. per day of Age	98	1.69	.71
Actual Birth Wt.	97	1.38	.64
Birth Wt. EPD	99	1.34	.57
Weaning Wt. EPD	98	1.42	.61
Yearling Wt. EPD	98	1.55	.69
Milk EPD	99	1.30	.58
EPD Accuracy	98	1.60	.65
Computed Score	96	1.52	.43
General Information			
Wt. of Bull on Sale Day	98	1.79	.65
Breed	99	1.14	.43
Pedigree	97	1.66	.78
Breeder or Consignor	99	2.12	.77
Color or Color Pattern	98	1.60	.78
Polled, Horned or Scurs	97	1.33	.64
Computed Score	95	1.62	.39

TABLE IV. (Continued)

Selection Criteria	Number*	$\bar{x}$	S.D.
Sale Factors			
Convenience of Selection	97	1.91	.74
Location of Sale	99	1.93	.77
Date of Sale	97	2.25	.76
Reputation of Sale	99	1.63	.75
Ability to Preview	99	2.06	.92
Order in Sale	<u>98</u>	<u>2.45</u>	<u>.80</u>
Computed Score	96	2.03	.55

*All totals do not sum to 99 due to non-response by all respondents

computer mean reported in Table IV reflects the average perceived importance for all criteria in that respective group. The "descriptive" category received the highest rating with a computed average of 1.43 (s.d. = .32). The "descriptive" category contained selection criteria dealing with the phenotypic characteristics such as; disposition, frame score, visual appearance, age, scrotal circumference, pelvic area, ribeye area, and fat thickness. Within this category, "disposition" was selected as the most important selection criteria with a mean of 1.18 (s.d. = .39), with frame score closely behind with a mean of 1.29 (s.d. = .46).

"Performance Information" followed "descriptive information" with an overall computed importance score of 1.52 (s.d. = .43). The criteria in this category dealt primarily with performance data which could be linked to certain heritable traits. Criteria in this category included; milk EPD, birth weight EPD, actual birth weight, weaning weight EPD, yearling weight EPD, EPD accuracy, adjusted 205-day weight, 112-day average daily gain, adjusted 365 day weight, and weight per day of age. The "milk EPD" was selected as the single most important selection criteria in this category with a mean of 1.30 (s.d. = .58). Other criteria in this category receiving a relatively high rating were "birth weight EPD" with a mean of 1.34 (s.d. = .57), "actual birth weight" with a mean of 1.38 (s.d. = .64) and "weaning weight EPD" with a mean of 1.42 (s.d. = .61).

The category of "general information" followed next in the relation to its mean score with an overall mean of 1.62 (s.d. = .39). The criteria in this group included "breed"; "horned, polled, or scurred"; "color or color pattern"; "pedigree"; "weight of bull on sale day"; and "breeder or consignor." The criteria in this category dealt primarily

with specific characteristics regarding the bull's composition. "Breed" was perceived to be the most important criteria in this category with a mean score of 1.14 (s.d. = .43). It should be noted that this particular criteria was the single most important selection criteria (in all groups).

"Sale factors" was the last category that was looked at during this study. This category had a mean of 2.03 (s.d. = .55). Criteria in this category included "reputation of sale," "convenience of selection," "location of sale," "ability to preview bulls," "date of sale," and "order in sale." The criteria perceived to be the most important was "reputation of sale" with a mean of 1.63 (s.d. = .75).

Common Selection Criteria and Their Relationship To Demographic Characteristics

Objective two was to determine the most common selection criteria used by buyers when purchasing bulls and the relationship of those criteria to selected buyer demographic characteristics. Data reported in the next seven tables relate to this objective.

Farming Status

Table V describes the effect of current farming status upon perceived importance of the previously defined criteria. The independent variable in this analysis was "current farming status." Respondents were grouped into two groups : full- and part-time/retired.

TABLE V. Manova Summary for the Effect of Buyers' Farming Status Upon Their Perceived Importance of Selection Criteria

Selection Criteria	Farming Status					
	Full-time			Part-time/Retired		
	No.	$\bar{x}^*$	S.D.	No.	$\bar{x}^*$	S.D.
Descriptive Information	45	1.48	.36	47	1.46	.29
Performance Information	45	1.41	.22	47	1.60	.52
General Information	45	1.59	.33	47	1.62	.43
Sale Factors	45	2.06	.60	47	1.98	.49

$t^2 = .08$, $df = 4$, 87 , $p = .15$

*The values ranged from "1" (very important) to "4" (very unimportant) on a Likert-type rating scale.

The dependent variables in this analysis were four scale scores regarding respondent perceptions of the importance of various kinds of selection criteria provided to them about the bull prior to the sale. Since all four dependent variables were moderately correlated, multivariate analysis was necessary to test the relationship between them and the independent variable. Based upon the data reported in Table V, there is no reason to conclude that there is a relationship between respondents' farming status and perceived importance to any of the four kinds of selection criteria provided to them about the bull.

Method of Marketing

Table VI describes the effect of "method of marketing calves" upon perceived importance of previously defined selection criteria. The independent variable in this

TABLE VI. Manova Summary for the Effect of Buyers' Method of Marketing Calves upon their Perceived Importance of Selection Criteria

Selection Criteria	Number*	$\bar{x}^{**}$	S.D.
Descriptive Information			
Auction	54	1.39	.30
Feeder Calves	20	1.44	.39
Direct Off-farm	12	1.43	.26
Other Methods	6	1.69	.38
Performance Information			
Auction	54	1.50	.36
Feeder Calves	20	1.56	.63
Direct Off-farm	12	1.45	.17
Other Methods	6	1.50	.21
General Information			
Auction	54	1.64	.43
Feeder Calves	20	1.49	.28
Direct Off-farm	12	1.64	.41
Other Methods	6	1.68	.18
Sale Factors			
Auction	54	1.90	.49
Feeder Calves	20	2.01	.56
Direct Off-farm	12	2.33	.66
Other Methods	6	2.42	.36

Lambda = .81, df = 12, 225, p = .11

*Totals do not sum to 99 due to respondents not answering some questions.

**The values ranged from "1" (very important) to "4" (very unimportant) on a Likert-type rating scale.

analysis was "method of marketing calves." Respondents were grouped into four groups depending on their calf marketing method: auction, feeder calf sale, direct off-farm, and other methods.

The dependent variables in this analysis were four scale scores regarding respondent perceptions of the importance of various kinds of selection criteria provided to them about the bull prior to the sale. Based on the data reported in Table VI, there is no reason to conclude that there is a relationship between respondents' method of marketing calves and perceived importance of any of the four kinds of selection criteria provided to them about the bull at the Senior Bull Performance Tested Program.

Education Level

Table VII describes the effect of respondents education level on their perceived importance of the previously defined selection criteria. Education level was the independent variable. Respondents were sorted into three groups depending on their level of education: high school graduate or less, some college or technical school, and college graduate.

The dependent variables in this analysis were the same four scales scores used in the previous analysis. Again, since all four dependent variables were moderately correlated, a multivariate analysis was necessary to test the relationship between them and the independent variable. Based on the data reported in Table VII, there is no reason to conclude that there is a relationship between respondents education and perceived importance of any of the four kinds of selection criteria provided to them about the bull.

TABLE VII. Manova Summary for the Effect of Buyers' Educational Level Upon Their Perceived Importance of Selection Criteria

Selection Criteria	Number*	$\bar{x}^{**}$	S.D.
Descriptive Information			
High School Graduate or Less	33	1.39	.31
Some College or Tech. School	24	1.43	.37
College Graduate or More	35	1.46	.31
Performance Information			
High School Graduate or Less	33	1.46	.35
Some College or Tech. School	24	1.62	.60
College Graduate or More	35	1.48	.29
General Information			
High School Graduate or Less	33	1.61	.36
Some College or Tech. School	24	1.73	.47
College Graduate or More	35	1.52	.33
Sale Factors			
High School Graduate or Less	33	1.97	.54
Some College or Tech. School	24	2.07	.51
College Graduate or More	35	2.03	.57

Lambda = .91, df = 8, 172, p = .45

*Totals do not add up to 99 due to respondents not answering some questions

**The values ranged from "1" (very important) to "4" (very unimportant) on a Likert-type rating scale

Buyers' Age

Table VIII describes the effect of the age of the buyer on perceived importance of the previously defined selection criteria. The independent variable in this analysis was the "age of the buyer." Respondents were grouped into four categories depending on their age: under 46, 46-55, 56-65, over 65.

The dependent variables in this analysis were four scores regarding respondents perceptions of the importance of various kinds of selection criteria provided to them about the bull prior to the sale. Since all four dependent variables were moderately correlated, a multivariate analysis was necessary to test the relationship between them and the independent variable. Based on the data reported in Table VIII, there is no reason to conclude that there is a relationship between respondents, age and perceived importance of any of the four kinds of selection criteria provided to them about the bull.

Size of Operation

Table IX describes the effect of the size of the buyers' beef operation upon their perceived importance of the previously defined selection criteria. The independent variable in analysis was "size of operation." Respondents were grouped into three groups depending upon the size of operation: under 50 cows, 50-100 cows and over 100 cows.

The dependent variables in this analysis were four scale scores regarding respondent perceptions of the importance of various kinds of selection criteria provided to them about the bull prior to the sale. Since all four dependent variables were moderately correlated, a multivariate analysis was necessary to test the relationship between them

TABLE VIII. Manova Summary for the Effect of Buyers' Age Upon Their Perceived Importance of Selection Criteria

Selection Criteria	Number*	$\bar{x}^{**}$	S.D.
Descriptive Information			
Under 46	24	1.47	.38
46-55	26	1.44	.32
56-65	19	1.41	.31
Over 65	23	1.38	.28
Performance Information			
Under 46	24	1.43	.30
46-55	26	1.67	.60
56-65	19	1.43	.26
Over 65	23	1.47	.32
General Information			
Under 46	24	1.68	.42
46-55	26	1.48	.27
56-65	19	1.73	.53
Over 65	23	1.57	.28
Sale Factors			
Under 46	24	2.12	.51
46-55	26	2.03	.59
56-65	19	1.89	.58
Over 65	23	2.01	.50

Lambda = .82, df = 12, 225, p = .15

*Totals do not sum to 99 due to some respondents not answering some questions

**The values ranged from "1" (very important) to "4" (very unimportant) on a Likert-type rating scale

TABLE IX. Manova Summary for the Effect of Buyers' Size of Beef Operation Upon Their Perceived Importance of Selection Criteria

Selection Criteria	Number*	$\bar{x}^{**}$	S.D.
Descriptive Information			
Under 50 Cows	26	1.41	.34
50-100 Cows	33	1.47	.31
Over 100 Cows	33	1.40	.32
Performance Information			
Under 50 Cows	26	1.57	.40
50-100 Cows	33	1.54	.50
Over 100 Cows	33	1.44	.29
General Information			
Under 50 Cows	26	1.63	.37
50-100 Cows	33	1.59	.34
Over 100 Cows	33	1.61	.44
Sale Factors			
Under 50 Cows	26	1.85	.48
50-100 Cows	33	2.03	.52
Over 100 Cows	33	2.13	.60

Lambda = .91, df = 8, 172, p = .44

*Totals do not sum to 99 due to respondents not answering some questions

**The values ranged from "1" (very important) to "4" (very unimportant) on a Likert-type rating scale

and the independent variable. Based on the data reported in Table IX, there is no reason to conclude that there is a relationship between respondents' size of beef operation and perceived importance of any of the four kinds of selection criteria provided to them about the bull.

Years in Cattle Business

Table X describes the effect of the buyers' number of years in the cattle business on perceived importance of the previously defined selection criteria. The independent variable in this analysis was "years in cattle business." Respondents were grouped into three categories depending on their years in the cattle business.

The dependent variables in this analysis were four scale scores regarding respondent perceptions of the importance of various kinds of selection criteria provided to them about the bull prior to the sale. Since all four dependent variables were moderately correlated, a multivariate analysis was necessary to test the relationship between them and the independent variable. Based on the data reported in Table X, there is no reason to conclude that there is a relationship between respondents' years in the cattle business and perceived importance of any of the four kinds of selection criteria provided to them about the bull.

Bull Management Practices

Table XI describes the effect of management practices employed by the buyer upon the arrival of the bull to its new farm to previously defined selection criteria. The independent variable in this analysis was "management practices when bull arrived at

TABLE X. Manova Summary for the Effect of the Number of Years in Cattle Business Upon Their Perceived Importance of Selection Criteria

Selection Criteria	Number*	$\bar{x}^{**}$	S.D.
Descriptive Information			
Under 20 years	25	1.46	.33
20-30 years	33	1.43	.35
Over 30 years	34	1.40	.30
Performance Information			
Under 20 years	25	1.56	.59
20-30 years	33	1.48	.33
Over 30 years	34	1.51	.32
General Information			
Under 20 years	25	1.55	.31
20-30 years	33	1.69	.45
Over 30 years	34	1.57	.31
Sale Factors			
Under 20 years	25	2.07	.51
20-30 years	33	2.05	.48
Over 30 years	34	1.95	.63

Lambda = .95, df = 8, 172, p = .85

*Totals do not sum to 99 due to respondents not answering some questions

**The values ranged from "1" (very important) to "4" (very unimportant) on a Likert-type rating scale

TABLE XI. Manova Summary for the Effect of the Buyers' Management Practices When Purchased Bull Arrived at Farm Upon Their Perceived Importance of Selection Criteria

Selection Criteria	Number*	$\bar{x}^{**}$	S.D.
Descriptive Information			
Turned in with Cows	18	1.35	.30
Isolated by Itself	61	1.42	.32
Penned with other Bulls	21	1.55	.36
Other Methods	1	1.38	.00
Performance Information			
Turned in with Cows	18	1.68	.71
Isolated by Itself	61	1.46	.28
Penned with other Bulls	21	1.51	.31
Other Methods	1	1.60	.00
General Information			
Turned in with Cows	18	1.58	.30
Isolated by Itself	61	1.59	.41
Penned with other Bulls	21	1.71	.41
Other Methods	1	1.67	.00
Sale Factors			
Turned in with Cows	18	1.99	.58
Isolated by Itself	61	2.03	.57
Penned with other Bulls	21	2.01	.40
Other Methods	1	2.00	.00

Lambda = .90, df = 12, 225, p = .70

*Totals do not sum to 99 due to respondents not answering some questions

**The values ranged from "1" (very important) to "4" (very unimportant) on a Likert-type rating scale

farm." Respondents were grouped into four categories: turned bull in with cows, isolated by itself, penned with other bulls and other methods.

The dependent variables in this analysis were four scale scores regarding respondent perceptions of the importance of various kinds of selection criteria provided to them about the bull prior to sale. Based on the data reported in Table XI, there is no reason to conclude that there is a relationship between respondents' management practices used upon the arrival of the bull to their farm and their perceived importance of any of the four kinds of selection criteria provided to them about the bull.

Perceived Level of Satisfaction with the Senior Performance Tested Bull Sale

The third and final objective of this study was to determine buyers' perceived level of satisfaction with the performance tested bull sale and its relationship to selected buyer characteristics. Data in Table XII are presented in support of the accomplishment of this objective. The dependent variable studied in this analysis was the respondents' level of satisfaction with the performance tested sale. A buyer satisfaction score was calculated to address this objective using six questions from the questionnaire. The questions used to calculate this score were:

- 1) Were the performance records printed in the catalog clear and useful to you in your selection?
- 2) Have you ever had any health problems with bull(s) you purchased at the Senior Bull Sale?

TABLE XII. Effect of Selected Buyer Characteristics Upon Their Perceived Level of Satisfaction with the Senior Performance Tested Bull Sale

Selection Criteria	Number	$\bar{x}^*$	S.D.
Farming Status			
Full-time	47	5.21	.81
Part-time/retired	52	5.13	1.09
$t=.40$, $df=97$, $p=.69$			
Method of Marketing Calves			
Auction	57	5.35	.97
Feeder Calf Sale	22	4.91	.92
Direct Off-farm	13	4.77	.93
Other Methods	7	5.29	.76
$F=2.08$, $df=3,95$, $p=.11$			
Educational Level			
High School Graduate or Less	38	5.21	1.02
Some College or Tech. School	24	5.46	.72
College Graduate or More	37	4.95	1.00
$F=2.18$, $df=2,96$, $p=.12$			
Age			
Under 46	24	4.88	.99
46-55	28	5.29	.98
56-65	20	5.20	1.01
Over 65	27	5.30	.87
$F=1.06$, $df=3,95$, $p=3.71$			
Size of Operation			
Under 50 Cows	28	5.25	1.04
50-100 Cows	36	5.19	.86
Over 100 Cows	35	5.09	1.01
$F=.24$, $df=2,96$, $p=.79$			
Years in Cattle Business			
Under 20 years	25	5.44	.65
20-30 years	37	4.97	.96
Over 30 years	37	5.19	1.10
$F=1.81$, $df=2,96$, $p=.17$			

TABLE XII. (Continued)

Selection Criteria	Number	$\bar{x}^*$	S.D.
Management of Purchased Bull			
Turned in with Cows	18	5.56	.62
Isolated in Pen	65	5.11	1.05
Penned with other Bulls	14	4.86	.77
Other Methods	2	6.00	.00
F=2.13, df=3,95, p=.10			

*The values ranged from "0" (not satisfied) to "6" (very satisfied).

- 3) Was the bull you purchased at the Senior Bull Sale a productive breeder?
- 4) Have you experienced any calving problems with your senior bull?
- 5) Do you feel that the bull you purchased at the Senior Bull Sale contributed positively to the genetic development of your herd?
- 6) Would you buy again from the test station?

Each of these questions could be answered either "yes or no" to give a positive or negative response. The satisfaction score (or mean) could therefore range from "0" (not satisfied) to "6" (very satisfied). Independent variable studied in this analysis were "farming status," "method of marketing calves," "education level," "buyers age," "size of operation," "years in cattle business," and "management practices of purchased bull."

Table XII reports the relationship of the nominally scaled independent variables to respondents level of satisfaction with the performance tested bull sale. Based on the data reported on Table XII, there is no reason to conclude that the buyer's "farming status," "method of marketing calves," "education level," "age," "size of operation," "years in cattle business," or "management practices of purchased bull" are significantly related to their level of satisfaction with the Senior Performance Tested Bull Sale.

CHAPTER V

SUMMARY OF MAJOR FINDINGS

The primary purpose of Chapter V is to present a general overview of the need, purpose and methodology of the study. Also, to discuss any major findings, conclusions and buyers recommendations for improvement of the Senior Performance Tested Bull Sale.

Need for the Study

The Senior Performance Tested Bull Sale program has a long prestigious history offering genetically superior bulls to the general public and especially beef cattle producers. This program brings bulls into a facility to compare the performance of these bulls "side-by-side" in a hope to reduce any of the variables of on farm testing. Bulls are treated alike and this gives the potential buyer the chance to truly see the performance data on the bulls. This along with the phenotypic characteristics of each offers the buyer a chance to select a bull to obtain maximum productivity.

The performance data collected from each individual while on test allows the breeders the opportunity to gain knowledge about the bloodlines within their herd as it deals with performance. The performance data collected on each can be used to improve the EPD accuracy of the bulls. The performance data collected on each bull allows potential buyers the chance to identify the desirable and undesirable heritable traits that

they want and need in their individual herd. These traits, which make up the bull's breeding value, are essential for the improved growth of the beef cattle business.

This study examined various criteria including : trait selection, perception of the effectiveness of the performance program, buyer characteristics, and the buyer's demographic characteristics in relation to the perceptions of selection criteria.

Purpose and Objectives of the Study

The purpose of this study was to determine the selection criteria buyers use for purchasing performance tested bulls at the Senior Performance Tested Bull Sale. To facilitate the purpose this study, the following specific objectives were developed:

1. To develop a profile of the buyer's personal and farm characteristics of producers who purchased performance tested bulls through the Senior Performance Tested Bull Sale.
2. To determine the most common selection criteria used by buyers when purchasing bulls and the relationship of those criteria to selected buyer demographic characteristics.
3. To determine buyers' perceptions of the level of satisfaction with the performance tested bull program and the relationship of those perceptions to selected buyer demographic characteristics.

Review of Literature

The review of literature attempted to examine the various segments of performance programs throughout the history of beef cattle production. Performance testing programs have been used throughout history in an attempt to improve the selection of genetically superior breeding animals in order to improve the food supply of the general public.

Tennessee cattle producers are always seeking breeding animals to improve the genetic heredity of their herds in order to maximum the profits of their herds. The beef cattle performance programs were established as a tool to assist beef producers in selecting bulls that had some performance data available. Beef producers could then temper the phenotype information with performance available.

In Tennessee, the bull testing program was started in 1958. In 1972, a central performance testing program was started on a farm near Nashville. The test site was later moved to the Middle Tennessee Experiment Station in Spring Hill, Tennessee. Bulls were grouped together and fed the same feed and this removed many of the variables that were present with producers performance testing programs.

Bulls on this test begin at an age of 7-10 months of age. The bulls are on a full feed test for 112 days. Strict screening of the bulls help insure that only the highest performing bulls make it to the sale.

A beef producer's attitude toward trait selection is perhaps one of the most important factors when selecting a breeding bull. Quite often, buyers depend upon a single trait for this selection and often overlook the genetic potential that is offered by

other bulls. The more knowledgeable the potential buyer is, the more characteristics that the potential buyer will consider. This sometimes causes the producer to weigh their options more carefully in an attempt to select the bull that will lend the most desirable genetic package toward the genetic improvement of their individual herd.

Through the early work done at Balmorhea, Texas, it was concluded that selection based on the performance of an animal should be an improved method for increasing the rate of gain in the calves sired by the performance tested bull (Baker, 1967). Increasing the efficiency and therefore increasing the profitability of the cow-calf operation is the bottom line of these operations. The potential buyer has a great number of variables to consider when selecting a herd sire. Phenotype (visual appearance) and genotype (genetic makeup) must be considered when selecting a bull if one is to improve the efficiency of their beef cattle operation.

Methodology

Identification of the Population

The sampling frame for this study was a validated list of 264 buyers who purchased performance tested bulls from the Senior Bull sale at the Middle Tennessee Experiment Station at Spring Hill, Tennessee. These buyers purchased bulls over a five year period from 1991 through 1995. The validated list of buyers was secured from the University of Tennessee Agricultural Extension Service Beef Cattle Breeding Specialist, Dr. David Kirkpatrick. The sample size for this study was 208. All buyers included in this study were Tennessee buyers and those with incomplete addresses or

bulls selected for a bull lease program were deleted prior to the selection of the sampling frame.

The questionnaire was mailed to 208 individuals who had purchased bulls from the Senior Performance Tested Bull Sale. Forty-one were returned and classified unusable due to incorrect addresses, deceased, or not interested in participating the study. Ninety-nine (47.6 percent) responses were classified as usable for the study.

Instrumentation

The instrument used in this study was a modified version of the surveys developed by Kenneth Ambrose (1989) "1989 Performance Tested Bull Buyer Survey" and "Breeders Performance Tested Bull Sale Survey" developed by Bruce Steelman (1993). Changes were made to increase the reliability of the instrument. The survey consisted of 29 questions which were used to collect data concerning attitudes toward the performance bull testing program, participants criteria used in bull selection and characteristics of the individual buyer and their farming operation.

The questions of the instrument represented a combination of nominally, ordinally and intervally scaled measures. The questions were a mixture of closed ended with unordered choices, closed ended with ordered choices and open ended questions.

A Likert-type attitudinal scale was utilized in measuring the responses. The questionnaire was designed to allow the participant to reply with a high level of reliability and was designed to be easy to complete by the respondent.

A panel was utilized to review the questionnaire prior to its administration and to check its face and content validity. A pilot test was utilized to check the questionnaire

face validity. A review of the data from these tests was required to assure the questionnaire supplied necessary information to complete the study.

Data Analysis

The statistical analysis package used in this study was the Statistical Package for the Social Sciences (SPSS for Windows version 8.0.0). Frequencies, means, standard deviations, percentages, Pearsonian correlation coefficients, and multivariate analysis of variance (Manova) were used to describe the relationships in the objectives of this study.

Major Findings

In regard to the major dependent variables studied, very little was learned regarding differences across the levels of most of the independent variables. However, the overall information compiled by the study will be useful in determining areas needing improvement or useful for participant input for suggestions for improvement.

The first objective was to develop an average profile of the individuals who purchase bulls at the Senior Performance Tested Bull Sale and their farming operation. All respondents in this study were male. Their ages ranged from 24 years old to 84 years of age, with a mean age of 55.7 years. Thirty-seven (37.4 percent) were college graduates, while 89 (89.9 percent) were at least high school graduates. Therefore, individuals purchasing bulls from this sale were approximately 55 years old and a large majority were at least a high school graduate. For this reason, one would assume that these individuals relied on a broad range of selection criteria when selecting a bull.

Only 11 (11.1 percent) respondents considered themselves to be retired, while 74 (74.8 percent) have been in the cattle business for 20 years or more. Therefore, one can safely assume that respondents are actively involved in beef production and have been involved in the beef cattle business for several years.

A majority (80.8 percent) of respondents relied on their beef enterprise as their major source of farm income. Respondents stated that the cow herds were well above the state average of 25 head, as 71 (71.7 percent) stated that their herds numbered 50 head or more.

The data show that 76 (76.8 percent) producers sold their calves at weaning and a majority (57.6 percent) used the auction market as the method of merchandising their calf crops. Eighty-one respondents (81.8 percent) owned 400 acres or less of pasture for their operation and 62 (62.6 percent) did not rent any pasture ground for their operation.

It should be noted that a large majority (89.9 percent) purchased their bulls at the test station site and 71 (71.7 percent) drove 100 miles or less to attend the sale site. It should also be noted that the video sites had not been in use for many years during the time that the respondents purchased the bulls.

Sixty-five respondents (65.7 percent) isolated the newly purchased bull by itself upon returning with it to the farm, while only 18 (18.2 percent) turned it out with the cows.

Seventy (70.7 percent) respondents reported that they were repeat buyers which helps explain why 81 (81.8 percent) of the respondents stated that they received information about the sale from a catalog sent from the Extension Specialist. Fifty-six (56.6 percent) received information about the sale from an Extension newsletter and 41

(41.4 percent) also received information from an Extension news article. None of the respondents stated that they received information on the bull sale through a television program. One can conclude that potential performance bull buyers either didn't watch agricultural programs or there were none available in the areas from which the respondents were located.

A majority of respondents (98.0 percent) felt that performance records were important and a large number of respondents (94.9 percent) found the information in the catalog useful. It should be noted that 74 (75.5 percent) did not experience any health problems and 89 (89.9 percent) stated that the bull was a productive breeder. Also, only 19 (19.2 percent) experienced having calving problems with the purchased bull.

In determining the respondents satisfaction with the sale, 84 (85.7 percent) felt that the bull did contributed to the genetic development of the herd and 91 (93.8 percent) stated that they would purchase again from the performance tested sale. The researcher found that the respondents perceived that the "descriptive" category was the most important to the buyers. This category received the highest computed score of 1.43. Within this category, "disposition" was selected as the most important selection criteria with a mean score of 1.18. "Performance information" followed with the highest computed score of 1.52. "Birth weight EPD" and "actual birth weight" were the highest scoring in this category with means of 1.34 and 1.38 respectively.

The category of "general information" followed next with a computed score of 1.62. It must be noted here that "breed" scored the highest not only in this category, but was also perceived as the highest selection criteria in the entire study with a mean score

of 1.14. "Sale factors" received the lowest computed score of any of the categories with a score of 2.03 and the "reputation of the sale" had a mean score of 1.63.

The researcher was somewhat surprised that in the "descriptive category" disposition was perceived as the highest selection criteria since there is little research to indicate that this is a genetic improvement. Visual appearance was also high in the selection criteria which tends to make the researcher think that respondents use more than performance records in selecting their bulls. Producers have stated that the "descriptive information" is more important than the "performance information." Therefore, it is safe to assume that respondents, while interested in performance, still consider the phenotype of the bulls to be as important as the performance when selecting bulls for their farm.

Objective two was to determine the most common selection criteria used by respondents when purchasing bulls and the relationship of those criteria to selected buyer demographic characteristics. From the data collected, there is no reason to conclude that there is a relationship between respondents' "farming status," "level of education," "method of marketing calves" or any other demographic characteristic and their perceived importance of any of the four kinds of selection criteria provided to them about the bull.

The third and final objective of this study was to determine the buyers' perceived level of satisfaction with the performance tested bull sale program and the relationship to selected demographic characteristics. While it does appear that the data indicate the buyers are satisfied with the performance tested bull sale program, there appears to be little evidence to conclude that any of the selected demographic characteristics provide any significant statistical differences between respondents.

Implications

The Senior Performance Tested Bull Sale program has made a tremendous positive impact on the beef cattle industry in Tennessee by making genetically superior bulls available to producers. The findings of this study prove that respondents perceive this sale to be an important part of their business and are satisfied with the program. Also it should be noted, that while respondents are interested in the improvement of the genetic base of their herd, they still tend to feel that the "descriptive information" is a more important selection criteria than the "performance information." Respondents of this study feel that the "breed" of the bull is the single most important selection criteria and this study found that the "breeder or consignor" was one of the least important selection criteria.

This study agrees with other studies that there is not as much difference between respondents with different demographic characteristics as one would expect. This study tends to agree with other studies that respondents perceive the "sale factors" of this program are less important than the "descriptive," "performance," or "general."

The fact that respondents perceived that "disposition," "frame score," and "visual appearance" were more important than "112-day average daily gain," weight per day of age," or "weaning weight EPD;" indicates a need to teach producers what is really going to improve the genetic potential of their herds.

Recommendations for Sale Improvement

Although a high level of satisfaction with the sale was perceived by the respondents, they did provide some suggestions for improvements and also shared some criticisms of the sale. The researcher combined these into a list and the following are the most common suggestions/criticisms:

- (15 percent) 1. Bulls are too fat when they are sold.
- (10 percent) 2. Incorporate more forage in diet/feed to hot.
- (9 percent) 3. Not enough choice of breeds/too many Angus.
- (7 percent) 4. Screen for physical problems/cull low quality bulls.
- (6 percent) 5. Improve loadout/loadout during sale.
- (5 percent) 6. Move sale to night/weekends for part-time farmers.

The above mentioned suggestions/criticisms and percentages are the frequency in which they occurred on the respondents' surveys. It should again be noted that only a small number of respondents listed criticisms regarding the sale.

It would be beneficial for producers and potential performance bull buyers to have educational sessions on the fundamental use of selection criteria in combination with phenotypic and genetic characteristics. From this study, some respondents really don't understand what characteristics are genetic and what are not. Extension Specialists and county personnel need to continue to provide educational programs to educate producers in this area.

As with any Extension program, publicity efforts need to be strengthened. Relying on past producers to publicize the sale is a major selling point. Increasing the

number of mass media outlets, especially those that are connected with television, can help publicize the program. Information on the web page of any and all University of Tennessee sources is another avenue to advertise the performance tested bull sale. County Extension Agents could be notified of the producers who have purchased performance tested bulls in the past. Keeping these people on a local mailing list would help notify producers of the upcoming sales.

Recommendations for Further Study

1. Further study would be in order to determine whether buyers truly understand the importance of performance criteria as a means of selecting sires to increase their herd's genetic potential.
2. This study should be replicated to determine whether buyers' perceptions of the relative importance of performance data has changed.
3. A similar type of study should be done on the other two performance tested programs in Tennessee.

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APPENDIX

203 1st Avenue North
Lewisburg, TN 37091

Dear Sir:

Since the early 1960's, the Tennessee Beef Cattle Improvement Association, in cooperation with the University of Tennessee Agricultural Extension Service, has sponsored the Central Bull Test Station. The purpose of this program is to provide superior bulls to improve the overall performance of the beef cattle herds throughout the state.

The Extension Service and the Beef Cattle Improvement Association want to make sure that this program meets the needs of Tennessee's beef producers. Sale records indicate that you purchased a bull from the Senior Bull Sale between 1991 and 1995. Therefore, we would like to know what you think about this program and the animal(s) you've purchased.

Please take a few minutes to complete the attached questionnaire and return it to me in the postage paid envelope. You will notice that the questionnaire has a number in the upper left corner. This number is simply a means of following up non-respondents to assure that we have made every effort to provide you a chance to respond. All responses are strictly voluntary and will remain confidential. Your name will **never** be linked to your responses and only grouped data will be presented in our final report. Return of the completed questionnaire indicates you agree to participate in this study.

Please return your questionnaire to me even if you choose not to respond so that I can remove your name from my follow-up list and not bother you again. Your response will help the Agricultural Extension Service and the Beef Cattle Improvement Association continue to provide an effective bull sale for area beef cattle producers. I would greatly appreciate your candid responses and comments about the Central Bull Test Station Senior Sale.

Thank you for your assistance. Please don't hesitate to call me at 931-359-1929 if you have any questions or additional comments you would like to share on the Senior Bull Performance Testing Program.

Sincerely,

Ricky C. Skillington
Extension Leader

TENNESSEE SENIOR TESTED BULL SALE SURVEY

Introduction: This questionnaire is an attempt to gather buyers' input on the Senior Bull Testing Program. The University of Tennessee Agricultural Extension Service strives to improve all of its programs. Your opinions as a buyer are beneficial in helping to evaluate and make improvements in this program. In responding to these questions, please think about the bull(s) purchased only through the Senior Bull Sale Program.

Section I.

1. Were the **performance records** printed in the catalog clear and useful to you in your selection? *(Circle the appropriate answer)*
 - a. Yes
 - b. No
2. Have you ever had any **health problems** with bull(s) you purchased at the Senior Bull Sale?
 - a. Yes
 - b. No
3. Was the bull **you purchased** at the Senior Bull Sale a productive breeder?
 - a. Yes
 - b. No
4. Have you experienced any **calving problems** with your Senior Bull?
 - a. Yes
 - b. No
5. After purchasing your bull, what did you do with your bull upon arrival at your farm? *(Circle the one best answer.)*
 - a. Turned the bull in with cows immediately upon arrival.
 - b. Isolated it in a pen or pasture by itself
 - c. Turned it in a pen with other bulls
 - d. Other (specify) _____
6. Are Performance Records important to you in selection of a bull?
 - a. Yes
 - b. No

7. Please rate the following performance characteristics on their importance to you when purchasing a bull by *checking the appropriate box*.

Performance Information	Very Important	Moderately Important	Moderately Unimportant	Very Unimportant
A. Adj. 205 Day Weight				
B. 112 Day Average Daily Gain				
C. Adj. 365 Day Weight				
D. Weight per Day of Age				
E. Actual Birth Weight				
F. Birth Weight EPD				
G. Weaning Weight EPD				
H. Yearling Weight EPD				
I. Milk EPD				
J. EPD Accuracy Estimate				

Section 2. We also need to know a little about you in order to better understand what kind of producers are purchasing bulls from the Central Bull Test Station Senior Sale.

1. What is your gender?
 - a. Male
 - b. Female
2. As of your last birthday, what was your age? _____
3. What is your county of residence? _____
4. What is your level of education? *(Circle One)*
 - a. Less than high school
 - b. High School Graduate
 - c. Some college or technical school
 - d. College graduate or more

5. What is your current farming status? *(Circle One)*
 - a. Full-time farmer
 - b. Part-time farmer
 - c. Retired
6. What is your major source of farm income? *(Circle One)*
 - a. Beef
 - b. Dairy
 - c. Swine
 - d. Row Crops
 - e. Tobacco
 - f. Other (Specify) _____
7. How many years have you been in the cattle business? _____
8. Number of beef cows of breeding age in your herd. _____
9. Describe your type of beef cattle operation. *(Circle all that apply)*
 - a. Cow/calf-sell at weaning
 - b. Cow/calf-retains ownership (backgrounding)
 - c. Cow/calf-custom feeding
10. Which method do you use to market the majority of your calves? *(Circle the one most appropriate answer)*
 - a. Auction market
 - b. Video Sale
 - c. Feeder Calf Sale
 - d. Direct off farm
 - e. Other (Specify) _____
11. How many acres do you have for beef production?
 - a. Permanent Pasture _____
 - b. Rented Pasture _____

Section 3. We need to know some information about the sale itself.

1. What was the location where you bought your most recent bull? *(Circle One)*
 - a. Spring Hill Test Station
 - b. Video Site
2. What is the distance from your farm to the site where you most recently purchased your Senior Bull?

a. 0 to 50 miles	c. 100 to 200 miles
b. 51 to 100 miles	d. More than 200 mile

3. Do you feel that the bull you purchased at the Senior Bull Sale contributed positively to the genetic development of your herd?
- Yes
 - No
4. The following are several factors producers may consider when purchasing herd sires. How important was each of these factors when you purchased your bull? *(Check level of importance for each factor)*

Sale Factors	Very Important	Moderately Important	Moderately Unimportant	Very Unimportant
k. Convenience of selection (Sale Day)				
l. Location of sale				
m. Date of sale				
n. Reputation of sale				
o. Ability to preview (Before Sale Day)				
p. Order in sale				

General Information about the bull

q. Weight of Bull on Sale Day				
r. Breed				
s. Pedigree				
t. Breeder or Consignor				
u. Color or color pattern				
v. Polled, Horned, or Scurs				

Description of the bull

w. Age				
x. Disposition				
y. Frame Score				
z. Scrotal Circumference				
aa. Fat thickness				
bb. Visual Appearance				
cc. Ribeye area				
dd. Pelvic area				

5. Please identify any method in which you received current and reliable information about the Senior Bull Performance Tested Bull Sale.

	Yes	No
a. Extension Newspaper article	_____	_____
b. Extension Radio Programs	_____	_____
c. Extension TV, Cable Shows	_____	_____
d. Extension Newsletter	_____	_____
e. Extension Meeting	_____	_____
f. Visit from Extension Agent	_____	_____
g. Visit to Extension Office	_____	_____
h. Telephone Calls to Extension Office	_____	_____
I. Telephone Calls from the Extension Office	_____	_____
j. Catalog Sent from Extension Specialist	_____	_____
k. Commercial magazine	_____	_____
l. Other (Specify) _____	_____	_____

6. What criticisms do you have of the Senior Bull Performance Tested Bull Sale?

7. What suggestions do you have for improvement of this program?

8. Was this your first purchase from the sale or are you a repeat customer?

9. Would you buy again from the test station?

- a. Yes
- b. No

10. Did you receive the registration papers in a short period of time?

11. Did the consignor follow up on your purchase?

**Thank you very much for your assistance.
Please return your completed survey in attached postage-paid envelope.**

VITA

Ricky Charles Skillington was born July 11, 1956. His parents were Dewey and Edna Skillington. He was raised on a general farm in Maury County, Tennessee and graduated from Santa Fe High School. He graduated from Columbia State Community College in 1976. While at Columbia State, he was a member of the state winning baseball team.

Ricky attended The University of Tennessee at Martin and received his Bachelor of Science degree in 1978. He was a member of the UTM Dairy Judging Team and was associated with the University's Rodeo Team.

Upon graduation, he taught high school vocational agriculture at Halls High School. He joined The University of Tennessee Agricultural Extension Service on October 1, 1979 as an assistant Extension agent doing 4-H agriculture work.

He was promoted and transferred to Marshall County on February 1, 1994 as county Extension leader. He is active in the Tennessee Association of Agricultural Agents and Specialists and has served as state president.

He is married to the former Kay Shaw and they have two children, Charles Moore and Ginger Kay. The family raises and exhibits registered Southdown sheep and cure country hams.

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