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SOUTH DAKOTA BEEF PRODUCER
MARKETING ALTERNATIVES

This thesis is prepared as a modification and independent investigation by a candidate for the degree Master of Science, and is acceptable for meeting the degree requirements for said degree. All portions of this thesis are hereby approved by the committee and are hereby recommended for the degree.

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degree Master of Science, Major in Economics
South Dakota State University

1984

SOUTH DAKOTA BEEF PRODUCER
MARKETING ALTERNATIVES

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clarifications in preparing a copy of this thesis.

This thesis is approved as a creditable and independent investigation by a candidate for the degree, Master of Science, and is acceptable for meeting the thesis requirements for this degree. Acceptance of this thesis does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

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This thesis is dedicated to the beef producers of South Dakota who will hopefully be able to more effectively market their beef products with the information provided in this paper.

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... to 2.0 billion head of cattle and calves annually with a value in excess of 1.5 billion dollars. Cattle are an important component of the South Dakota agricultural economy. South Dakota cattle are important to the nation as the state ranks ninth in total production of cattle and calves. The average farm produces cattle and calves numbered 45-50 percent of the total agricultural value and 75-80 percent of total livestock income for the state. Income from the cattle business is a definite impact on the total economy of the state. For example, a fifty cow herd produces 10 cattle per year and approximately 100 calves per year. This herd would produce 100 calves per year and 100 calves per year. The entire state economy as it is multiplied through all markets.

Market Identification

The market for cattle and calves is very difficult for producers to understand and identify. Their systems, a general lack of knowledge of markets and marketing channels and their impact on their sales.

Chapter One

Introduction

South Dakota beef producers market approximately 1.8 to 2.0 million head of cattle and calves annually with a value in excess of 1.5 billion dollars.

Cattle are an important component of the South Dakota agricultural economy. South Dakota cattle also are important to the nation as the state ranks ninth in total production of cattle and calves.

The revenue from marketing cattle and calves comprises 45-50 percent of the total agricultural sales and 75-80 percent of total livestock income for the state. Income from the cattle business has a definite impact on the total economy of the state. For example, a fifty cent increase in cattle price per hundredweight would net producers about nine million dollars per year. This increase in income would benefit not only the producer but the entire state economy as it is multiplied through all sectors.

Problem Identification

The volatility of cattle market prices makes it very difficult for cattlemen to consistently maximize their returns. A general lack of knowledge of alternate marketing channels and their impact on profit makes

marketing uncertain.

Although a great deal of information is available, little framework has been established to provide beef producers with the necessary information to aid in reducing their price risk and uncertainty. No comparison of marketing channels has been made to determine if a certain channel is better or worse than the others. If cattlemen have available the necessary information to make more effective marketing decisions, it is quite likely they will improve their profits.

The information developed in this study can serve as a basis for development of an alternate marketing strategy system for the beef business. The study can aid marketing efforts of both fat cattle feeders and producers of feeder calves. With the use of this information the producer can better evaluate his future marketing alternatives and make more effective decisions regarding his enterprise scope.

If beef producers had better information on marketing alternatives and a way to analyze the alternatives, their marketing efficiency could be improved. Current extension meetings held throughout the state present information on what has happened in the recent past for the beef industry and some short range forecasts on numbers of cattle and prices. However, the extension service could be more effective if they were able to present a formal framework

for analyzing marketing alternatives in the beef business. The beef producers could benefit greatly from this type of service.

Objectives

The general objective of the research presented in this thesis was to determine if differences in prices exist among several marketing alternatives available to beef producers. Beef producers are divided into two categories; feeders of beef for slaughter, and producers of feeder calves. The marketing alternatives analyzed are terminal market, direct buyers, auction sale barns and futures market.

Specific objectives were:

1. To collect and analyze price data for slaughter cattle from the Sioux Falls terminal market, direct buyers, and futures contracts for a ten year period, 1973-1982, and determine if price differences existed between the three alternatives.
2. To collect and analyze price data for feeder cattle from the terminal market, futures contracts, and local auction barns for a five year period, 1978-1982, and determine if price differences existed between the three marketing alternatives.

Scope and Outline of the Study

The first part of this chapter introduced the problem area for the study. Certain deficiencies in beef marketing were mentioned and outlined as the basis for this study.

The second chapter deals with a review of literature. A theoretical literature review is utilized to establish a theoretical background for the real problems being faced by beef producers. An applied research review is then conducted to indicate work done in various parts of the United States on similar problems.

Chapter three consists of the procedures used in conducting the research. It outlines the methods for collection of data, methodology used and how the data was analyzed.

In the fourth chapter the results of the research analysis are delineated.

The conclusions and a summary of the study and its limitations are included in Chapter five.

Chapter Two
Literature Review

Introduction

Risk and uncertainty are important factors of many agricultural operations, including beef farms. Decisions on procurement, production and marketing are made on the basis of imperfect knowledge about future conditions.

The stochastic nature of such conditions may result in a loss for the farmer despite care taken in making decisions.

A primary source of risk in the cattle business is imperfect knowledge about future prices. An experienced cattleman can estimate fairly accurately the cost of feeding or raising cattle to a certain weight and grade, and can affect the performance in most instances. But, future prices are dependent on many interrelated variables beyond his control. The beef producer must, however, develop some knowledge of future pricing in order to reduce the risk and uncertainty in his business. Information about future pricing probably is most crucial for the purchasing decision but also needs to be evaluated during the growing or feeding period to determine selling time.

It is necessary for the modern beef producer to not only do a proper job of managing the growing and

finishing of cattle, but also be adept at marketing his product. The marketing procedure should begin even before production starts. The producer should have the ability to examine the feasibility of starting a production process, and then analyzing the marketing alternatives for the beef all the way to market time.

Review of Theoretical Literature

Risk management is important for a successful beef operation. One possible way to manage risk is through choice of firm size and leverage configuration. As firm size increases, the need for nonequity funds becomes larger in order to finance land and machinery purchases as well as operating expenses. The nonequity funds consist of credit obtained to expand the operation. Greater use of credit results in larger fixed repayment commitments, and a drop in income creates the possibility that obligations might not be met. In that case, the assets of the farm may become seriously or totally impaired.

According to Samuelson (1967), diversification of activities is a well known means of coping with risk. This strategy allows a below average outcome in one enterprise to be partly or completely offset by an above average outcome in another. Flexibility in production is a widely accepted means of diversification.

Marketing strategies also can be used to cope with risk. Just as diversification can be used to smooth out price fluctuations, a farmer can "average" prices by selling at several different times during the year. Leuthold (1975) indicated this potential to reduce risk through various marketing strategies.

According to Radner (1970), Arrow and Debreu have developed a theory in elaboration of the Walrus-Pareto theory of value that is applicable to the case of uncertainty. This Arrow-Debreu theory can be extended to account for differences in information available to different economic agents and for the production of information. The basic idea is that commodities are to be distinguished not only by their physical characteristics and by the location and dates of their availability and/or use, but also by the environmental event (discussed below) in which they are made available and/or used. This theory applies to the beef producer who is producing a product that can be graded differently and has varying marketing times and locations.

The "physical world" is decomposed into three sets of variables: 1) decision variables, which are controlled (chosen) by economic agents; 2) environmental variables, which are not controlled by any economic agent; and 3) all other variables, which are completely determined by decision and environmental variables. A state of the

environment is a complete specification of the environmental variables from the beginning to the end of the economic system in question. An event is a set of states. The Arrow-Debreu theory says that although we cannot know the future with certainty, at any given date there will be a family of elementary observable events, which can be represented by a partition of the set of all possible states into a family of mutually exclusive subsets.

The theory goes on to explain that there are two groups of economic agents in the economy: producers and consumers. Each producer is characterized by a set of production plans that are feasible for him, his production possibility set. Each consumer is characterized by a set of consumption plans that are feasible for him, his consumption possibility set. An equilibrium of the economy is a set of prices, a set of production plans, and a set of consumption plans, to maximize present values and preferences within budget constraints. Arrow and Debreu go on to say that attitudes and beliefs toward risk play no role in the assumed behavior of producers. However, beliefs and attitudes do play a role in the assumed behavior of consumers. In an Arrow-Debreu economy, at any one date each agent will have incomplete information about the state of the environment, but all the agents will have the same information.

The beef producer has the opportunity to analyze

and change production possibilities even before production begins. While it is possible for the beef producer to alter his production, a lack of information for framing accurate decisions makes risk and uncertainty a reality in the production of beef.

This last assumption of the Arrow-Debreu economy, according to Radner (1970), is not really valid if we take into account the real effects of uncertainty in the economy. The economic agents must possess capabilities of imagination and calculation that are not realistic. Another area of criticism by Radner is that producers do not have a clear cut way of comparing net revenues at different dates and states. Also the Arrow-Debreu model does not take into account the use of hedging, storing goods, or forecasting future prices as it depends primarily on present value.

Demsetz (1982), in his article on Information and Efficiency: Another Viewpoint, states that lack of adequate information leads to uncertainty in marketing. If we knew how much and what types of information would be desirable we would have a more efficient marketing system. We do not know these things, but there are ways to weight factors and be able to reasonably estimate information needed. A framework for decision making for the beef producer, for example, could consider all factors and develop a model for estimating price at a future time.

Another theory dealing with lack of information and its effect on uncertainty has been dealt with by Stigler (1982) in a discussion of information in the labor market. Stigler identifies the problem as one of how to acquire information and keep the information current. Lack of homogeneity is present in many markets and complete knowledge is seldom possessed. Fluctuations in supply and demand add another source of uncertainty, and information becomes obsolete. Stigler states that the information a man possesses is capital, it was produced at a cost, it yields benefits, and can be evaluated by the usual method of evaluating an asset, by discounting its future revenue. From a social viewpoint, the return from investment in information consists of a more efficient allocation of products.

Another way of reducing risk and uncertainty is the use of futures markets. Much theory has been hypothesized in this area and some of the arguments put forward on their use will be discussed. A number of prominent economists have different ideas on the use of futures markets, their value and stability.

Keynes in 1930 proposed his theory of normal backwardization and emphasized the financial risk posed by the necessity for carrying inventories of agricultural products. He suggested that futures markets exist to facilitate hedging. In his view, futures prices are

unreliable estimates of the spot or cash price on the date the futures contract expires. He believed it "normal" for the futures price to be a downward biased estimate of the actual future price. This theory, in effect, argues that the speculators sell "insurance" to hedgers and that the market is inefficient because the futures price is not an unbiased estimate of the actual future price. Keynes (1930) argues that the hedgers use the futures market to avoid risks and they pay a premium to speculators for the insurance.

Hicks, in his book, Value and Capital, in 1939, stated that a way does exist, within the orbit of private enterprise, whereby expectations and plans can be coordinated. This way is the device of forward trading. Ordinary businessmen can enter into forward futures trading to "hedge" or lower their risks. Hicks gives credit to Keynes for his theory of normal backwardization and agrees that the hedger has to pay a "premium" (similar to an insurance premium) to utilize the futures market. The traders' prime objective is to reduce the risk in selling a product.

Recent work done by Carter, Rausser, and Schmitz (1983) has verified that the Keynesian theory of normal backwardization has merit. They used a generalized Keynesian notion provided by a CAPM (capital asset pricing model) to reveal that significant and positive

risk does exist for producers of wheat, corn, soybeans, cotton and live cattle. The CAPM can be summarized as:

$$E(\bar{R}_j) - R = B_j [E(\bar{R}_e) - R]$$

where E is the expectation operation, \bar{R}_j is the return on asset j , \bar{R}_e is the return on the market portfolio, R is the return on a riskless asset and B_j is the systematic risk of asset j .

Other work done by Nicolus Kaldor (1939) initially hypothesizes that the "forward price" may be above the expected price. His argument starts with the following equation:

$$CP + i + c' - q + r = EP,$$

where CP = current price, i = interest rate, c' = carrying cost, q = marginal yield of stocks, r = marginal risk premium, and EP = expected price. Normally stocks will be held up to the point where the degree of backwardization covers the cost of holding the stocks minus the convenience yield:

$$CP(1 + i) + c' = FP, \quad CP + i + c' - q = FP$$

where FP = future price.

The risk of changes in the value of the stocks can be transferred by selling forward and the stockholders, since

they want to reduce risk, will sell at a price lower than the expected price:

$$FP + r = EP$$

Mr. Kaldor argues that in special cases this is not so. In certain cases the hedgers will be forward buyers. The speculators will be forward sellers, and to cover their risks will hold stock. On these stocks they will not gain the convenience yield since they have already sold them and thus:

$$CP + i + c' = FP, \text{ and then:}$$

$$FP + r - q = EP$$

This says that the forward price can exceed the expected price by the amount by which the marginal yield exceeds the marginal risk premium. Kaldor in essence is saying that sometimes but, not always, the yield is lost by hedging.

Kaldor later modified his theory to say that hedgers are likely to be both buyers and sellers of futures and their opposite risks cancel each other out. Then the future prices in transactions between hedgers and hedgers can vary anywhere between $EP - r$ and $EP + r$. Speculators are required to take up only that part of the risks which do not cancel out. In other words, if the hedgers are predominately sellers of futures, speculators will buy the excess of the amount hedged by the sellers over the amount hedged by the buyers, and vice versa. In the first case,

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the futures price will be lower than the expected price by the amount of the marginal risk premium. In the second case, the future price will exceed the expected price by the same amount.

Another theoretical study of the equilibrium relationship between futures prices of farm products and spot prices was done by Anderson and Danthine in 1983. They say that in view of the fact that most futures markets involve storable goods and that storage companies do trade futures, then their results lend support for backwardization. Anderson and Danthine purport that it is not possible, however, to demonstrate conclusively from a theoretical point of view the predominance of the normal backwardization. The general conclusion is that the direction of bias in future markets depends on the characteristics of the hedgers involved.

The economic theory dealing with marketing indicates that many variables face the beef producer in being able to effectively market their slaughter or feeder beef. The theory implies that it is necessary for a beef producer to examine all alternatives from pre-production all the way through actual marketing time.

Review of Research Literature

It appears quite universal that beef producers have

problems with marketing their product and need better information on marketing as indicated by Johnson in 1974. Market instability characterizes the U.S. beef cattle industry and is a function of fluctuating beef supplies. A 1981 study at Colorado State University indicated that, since demand for beef is inelastic, a small change in quantity supplied can have a proportionately larger impact on price. According to Wellman of Nebraska (1971), producers must learn to cope with beef price fluctuations and develop a better information system in order to be successful.

A project completed in 1982 by Sarhan and Nelson reports that the complexity of the changes in the livestock industry causes producers, marketing firms and government agencies often to find it difficult to understand and keep abreast of the status of the livestock meat economy. There are many factors at work simultaneously that can affect the prices of livestock and it is important that producers be aware of this. Without proper information a farmer is not able to operate in the competitive market that is most advantageous for him.

It is quite possible that a single marketing alternative will not always be the best. The profitability of a beef operation will most certainly require utilization of several marketing options. Studies published by Bullock and Logan in 1972, Colorado State University in 1981 and the University of Illinois in 1980 all indicate

the same need for utilizing alternate marketing systems at different times.

Many ways to market beef and receive information are available to producers. One of the larger problems they face is that of knowing the alternatives and sources. Research in Illinois by Sarhan and Nelson (1982) and in Nebraska by Wellman and Jorgensen (1972) indicate marketing alternatives that are available to farmers. For example, marketing channels include terminal markets, direct buyers, auction markets, futures contracts, buying stations, local markets, country dealers, pools, cooperatives and other farmers. Sources of information also are many and varied. Some of them include radio, television, newspapers, magazines, word of mouth, county agents, N.F.O., "cattle fax", telephone information services and various published "sheets".

Results of a study completed by Clauson in 1982 indicate that the most used market information source by South Dakota farmers is radio. Television and newspapers follow in order of use for information. The study indicated that most farmers use two or less sources of information for marketing or purchasing cattle.

Several studies have been completed in recent years dealing with making marketing decisions. Work done by Bullock and Logan in 1972 utilized formulation of models and development of linear programming to make decisions

with the use of certain criteria such as a price forecasting model. Price forecasting beef prices in Illinois (1980) was developed using a master model for midwest agriculture and included many variables to reduce chance for error.

Other research was done to assist farmers in making marketing decisions by Janssen and Hassler in 1981 and dealt with a dynamic operational decision model for a farrow to finish swine operation. This is a rather complex system that requires constant updating, monitoring and use of a computer and probably is best suited to large producers or the industry in an area.

Research done in South Dakota in regard to beef marketing has been somewhat limited. Clauson (1982) did a study on the market structure and conduct of the beef industry which studied information sources used by farmers and marketing alternatives used. It also provided information on the structure of the beef industry. Little information was provided by this work on actual producer marketing practices and analysis of markets.

Research done by Francke (1974) analyzed feeder cattle marketing by South Dakota beef cattle producers. This study reported only when feeder cattle are marketed and did not get involved with the analysis of marketing or choosing of a marketing channel.

The literature most certainly indicates that livestock producers have difficulty with marketing their

product. It appears that lack of information is a major deficiency in most producers' marketing plans.

CONCLUSIONS

The objective in collecting and analyzing the data presented in this report was to determine if any price differentials were present in the horse marketing information system. The following objectives were set for the study: to determine if price differentials were present in the horse marketing information system; to determine if price differentials were present in the horse marketing information system; to determine if price differentials were present in the horse marketing information system.

Price differentials in the horse marketing information system were found. This allows the researcher to determine if differentials in price exist in the market of selling cattle in the futures market.

Only one terminal market exists in North Dakota and is located in Bismarck. The Bismarck Stockyards are the largest terminal market for livestock in the United States in 1977 and 1978. All horse marketing goes through the Bismarck Stockyards and is located in the United States.

Since the data were not available to obtain from individual companies or they are reluctant to provide such information. It was possible to obtain information from

Chapter Three

Procedures

Introduction

The objective in collecting and analyzing data for slaughter and feeder beef was to determine if any price differences were present in the three marketing alternatives selected. The marketing alternatives selected for slaughter cattle were: terminal market, direct buyers, and forward contracting. For feeder cattle the following alternatives were selected: terminal market, local auction barns and forward contracting.

Five options on the forward contracting alternative were used. This allows the researcher to interpret if differences in price exist in the timing of selling cattle on the futures market.

Only one terminal market exists in South Dakota and is located in Sioux Falls. The Sioux Falls Stockyards was the largest terminal market for livestock in the United States in 1982 and 1983. More total livestock moved through the Sioux Falls Stockyards than any other terminal in the United States.

Direct buyer prices are quite difficult to obtain from individual companies as they are reluctant to provide such information. It was possible to obtain composite direct

buyer prices from the U.S.D.A. Consumer and Marketing Service Livestock Division located in Des Moines, Iowa.

Slaughter Cattle

Price data for slaughter cattle were collected from three sources: the terminal market at Sioux Falls, direct buyers for South Dakota, and futures prices from the Chicago Mercantile Exchange. Price data were collected by month for ten years, 1973 through 1982. Daily prices were averaged to determine the monthly prices.

Slaughter cattle prices were taken on choice steers weighing 1,050 pounds to 1,200 pounds. The same weight range and grade was used for all three marketing channels.

It is assumed that the normal feeding period for choice steers weighing 500-650 pounds is approximately 270 days. The average daily gain is assumed to be 2.3 - 2.5 pounds per day. After a normal feeding period, the choice steers should be marketed at about 1,050 - 1,200 pounds.

Terminal Market

Terminal market prices were collected at the U.S.D.A. Livestock Reporting Service Office in the Sioux Falls Stockyards. Data were extracted from the daily records kept at that office.

Direct Buyers

Direct buyer prices were furnished by the U.S.D.A. Consumer and Marketing Service Livestock Division in Des Moines, Iowa. Monthly prices were provided for the years of 1973 to 1982. The prices are applicable to the South Dakota direct buyers who purchase slaughter beef in the state.

Futures Contracts

The futures contract prices were taken from the yearbooks of the Chicago Mercantile Exchange. For the purpose of this study, five different futures prices were selected for each month that slaughter cattle were sold. For example, if June, 1973 was the selling date for cattle, five different futures prices were analyzed. Table 3.1 summarizes how the five futures prices were selected for each marketing time. This table illustrates the dates of evaluation and the five futures contracts which may be used for a particular selling month. There are six columns in the table. The first column denotes the month that cattle will be ready for market, and columns two to six list the five future contracts to be examined for the proposed selling month.

Table 3.1: Dates of Evaluation of Five Future Contract Prices Used for a Typical Selling Month for Feeder Cattle and Slaughter Cattle

1	2	3	4	5	6
<u>Month Cattle are Ready for Market Delivery</u>	<u>1st Future Contract, 300 Days Before Delivery</u>	<u>2nd Future Contract 240 days to Delivery</u>	<u>3rd Future Contract 150 days to Market</u>	<u>4th Future Contract 60 days to Market</u>	<u>5th Future Contract Market Month</u>
January 1973	March 1972	May 1972	Aug. 1972	Nov. 1972	Jan. 1973
February 1973	April 1972	June 1972	Sept. 1972	Dec. 1972	Feb. 1973
March 1973	May 1972	July 1972	Oct. 1972	Jan. 1973	March 1973
April 1973	June 1972	Aug. 1972	Nov. 1972	Feb. 1973	April 1973
May 1973	July 1972	Sept. 1972	Dec. 1972	March 1973	May 1973
June 1973	Aug. 1972	Oct. 1972	Jan. 1973	April 1973	June 1973
July 1973	Sept. 1972	Nov. 1972	Feb. 1973	May 1973	July 1973
August 1973	Oct. 1972	Dec. 1972	March 1973	June 1973	Aug. 1973
September 1973	Nov. 1972	Jan. 1973	April 1973	July 1973	Sept. 1973
October 1973	Dec. 1972	Feb. 1973	May 1973	Aug. 1973	Oct. 1973
November 1973	Jan. 1973	March 1973	June 1973	Sept. 1973	Nov. 1973
December 1973	Feb. 1973	April 1973	July 1973	Oct. 1973	Dec. 1973

The first futures contract price selected was 300 days before selling. This would allow the cattle feeder a chance to examine the futures prices 30 days before putting cattle in the feedlot, see Column 2 of Table 3.1.

A second futures contract price was selected at a point 240 days before expected selling time (Column 3, Table 3.1). At this time the cattle should have been in the feedlot approximately 30 days. The cattle feeder has had an opportunity to see how the calves are performing and can start analyzing when to market the cattle and may want to analyze the future price.

The third future price used is 150 days before marketing of the live beef (Column 4, Table 3.1). By this time, many producers may desire to estimate the marketing date and could be apprehensive about the selling price.

A fourth future price has been selected 60 days before marketing (Column 5, Table 3.1). At this point in the feeding cycle the cattleman is nearly ready to market and is probably thinking about the next group of cattle he is going to feed. If he has not already used the futures market and is inclined to do so, he is quite likely to analyze the futures contract at this stage in feeding.

The fifth price in the futures analysis is the month cattle are actually marketed (Column 6, Table 3.1). Some producers may analyze the futures price at this time in hopes that it will be higher than the cash price offered by

other marketing alternatives.

Live cattle futures were offered for the delivery months of: January*, February, April, June, August, October and December. For those months that did not have a futures contract, the futures contract price for the following month was used. No contract is offered for March futures so the April contract price was used in this analysis for the March price. The June contract price was used for May, the October price was used for September marketing and the December futures price was used for November marketing. The monthly delivery prices were determined for each marketing month for live cattle as listed in Table 3.2.

Table 3.2: Live Beef Average Monthly Futures Contract Prices Used for Each Calendar Month

<u>Month Cattle are Ready for Market</u>	<u>Monthly Futures Contract Price Used</u>
January	January
February	February
March	April
April	April
May	June
June	June
July	August
August	August
September	October
October	October
November	December
December	December

* January contract eliminated after 1982.

An analysis of variance was performed on the data to determine if a difference in the mean prices of marketing alternatives existed. The analysis of variance procedure is a powerful procedure for testing the homogeneity of a set of means. However, if the ANOVA suggests that the means are not equal, we still do not know which of the sample means are equal and which are different. For this reason, it was also decided to perform the Waller-Duncan k-ratio t-test to determine which means are different if a significant difference is indicated by the analysis of variance. Results of the statistical testing is reported in Chapter Four.

Analysis of Variance

The analysis of variance is a statistical technique for analyzing certain kinds of measurements. The measurements involved in this study are mean monthly prices of marketing alternatives. If only two means were being compared, a simple t-test could be performed to test the difference; however, this study includes two means and it is applicable to do the analysis of variance. It is a test to determine if differences exist between more than two means.

In mathematical form, the null hypothesis would be:

$$H_0: u_1 = u_2 \dots = u_n ,$$

where u_i is the mean price of the i^{th} marketing alternative and the research hypothesis would be:

$$H_r: u_1 \neq u_2 \neq \dots \neq u_n$$

The level most often set for rejection of the null hypothesis is a probability of less than .05.

The researcher uses analysis of variance as a method for making a probability statement about a null hypothesis. The calculations of ANOVA will yield a statistical number called F. If the F value is sufficiently high, compared to a critical value, the null hypothesis can be rejected and we can accept the research hypothesis that differences among means are present at a certain probability level.

One thing that needs to be noted is that the hypothesis to be tested is an overall statement. That is, analysis of variance will tell us only if there is a significant variation among the means in that hypothesis. It will not tell us about the comparison of individual means. The procedure of analysis of variance centers upon the question of whether all of the means represent the same population.

As mentioned earlier, the F test is used to determine a probability value. To calculate F, two values are used. The first is called variance "between groups". This is the amount of variation the different groups means have

about the grand mean. The more differences there are among the groups, the greater would be the value of the between groups variance. The second value used to calculate F is the "within groups" variance. The "within groups" value indicates how much variation occurs within each group.

If each group of means is from the same population it would be expected that the variation "between groups" and "within groups" would be about equal. The more that a value of "between groups" exceeds that of "within groups", the greater would be the probability that the groups represent different populations. Hence, we have the following definition of F :

$$F = \frac{\text{Variance between groups}}{\text{Variance within groups}}$$

If the null hypothesis is correct and there was no sampling error, we would expect the F test to be equal to 1.0. However, in reality the prospect of sampling error must be faced. Between group variance is calculated by summing squared deviations of group means from the overall mean, and within group variance is calculated using squared deviations of the scores within groups about their own mean. These component squared deviations are then divided by their respective degrees of freedom to derive the variances. The degrees of freedom are the number of groups minus one for the "between groups", and the number of items in each

group minus one for the "within groups".

Tables have been developed to determine critical values of F according to the degrees of freedom for the groups being compared and the size of the groups.

If the analysis of variance results indicate that the null hypothesis can be rejected, the researcher must perform another test to determine where the differences in means occur. A cautious test that reduces Type 1 error (that is, rejection of the null hypothesis that should not be rejected) is preferable. One such test is the Waller-Duncan k-ratio t-test. This allows the researcher to determine where differences exist. It also groups means that are not significantly different from one another. Much useful information that can be used in developing conclusions can be derived from this test.

Feeder Cattle

Price data for feeder cattle were collected from three major sources: the terminal market in Sioux Falls, futures contracts from the Chicago Mercantile Exchange, and ten selected auction markets in South Dakota.

The price data were collected for five years, 1978 through 1982. Daily or weekly prices were averaged to determine a monthly price. The monthly means were then used in an analysis of variance procedure to test the

hypothesis that no difference exists in the mean price received at the marketing alternatives for feeder cattle.

Choice steer feeder calves weighing 500-650 pounds were selected as the subject of this study. The same weight range and grade was used for all three marketing alternatives.

Terminal Market

Terminal market prices were collected at the U.S.D.A. Livestock Reporting Service Office in the Sioux Falls Stockyards. Data were extracted from daily records kept at that office.

Futures Contracts

The futures contract prices were taken from the yearbooks of the Chicago Mercantile Exchange. For the purpose of this study, it is assumed that the calves are marketed at 500-650 pounds. Also, this study assumes that the feeder calves will be marketed approximately 270 days after birth.

Five different futures contract prices were selected for each month that feeder calves might be marketed. Table 3.1 summarizes how the five future prices were selected for each marketing month.

The first futures contract the beef producer might examine is 300 days before the expected feeder calves are

marketed. This time period is about 30 days before the calves are born.

A second futures contract price is selected 240 days before marketing. At this time the calves are approximately 30 days old and the producer may want to examine future selling prices.

The third futures contract price used is 150 days before expected marketing of the feeder calves. The feeder calves are four months old and well into their growing period. This point is often used by producers to estimate their final calf crop and would be a likely time to examine future prices.

Futures price number four is selected 60 days before expected marketing of the calves. At this point in the growing period producers are likely to be carefully examining all possible price alternatives, including the futures contracts. If the feeder calf producer has not examined the future price previous to this time, then this may be an opportune contract to examine.

The fifth price used in the futures analysis is the price for the actual month the calves are going to be sold. It is probable that producers may look at the futures contract to determine if it would be more profitable to deliver on a futures contract rather than sell on a cash basis through the other marketing outlets.

Feeder cattle contracts are offered for delivery months of: January, March, April, May, August, September, October and November. The months of February, June, July and December are not delivery months. Prices used in this study for months that are not delivery months are derived from the closest delivery month after the expected marketing time. For marketings expected in February, the March futures contract prices are used. The August delivery price is used for both June and July and the January delivery month price is used for expected marketing in December. Table 3.3 illustrates how the contract month price was determined for each expected marketing month.

Table 3.3: Feeder Calf Futures Contract Months Used for Each Expected Marketing Month

<u>Month Feeder Cattle Are to be Marketed</u>	<u>Monthly Futures Contract Price Used</u>
January	January
February	March
March	March
April	April
May	May
June	August
July	August
August	August
September	September
October	October
November	November
December	January of the next year

Auction Markets

Ten local auction barns were selected to furnish data on sales of 500-650 pound feeder calves for the years 1978 to 1982. Prices were derived from sale barn data and published results of each sale day. Weekly sales are held at each of the auction barns and the mean weekly data were averaged to determine a monthly sale price.

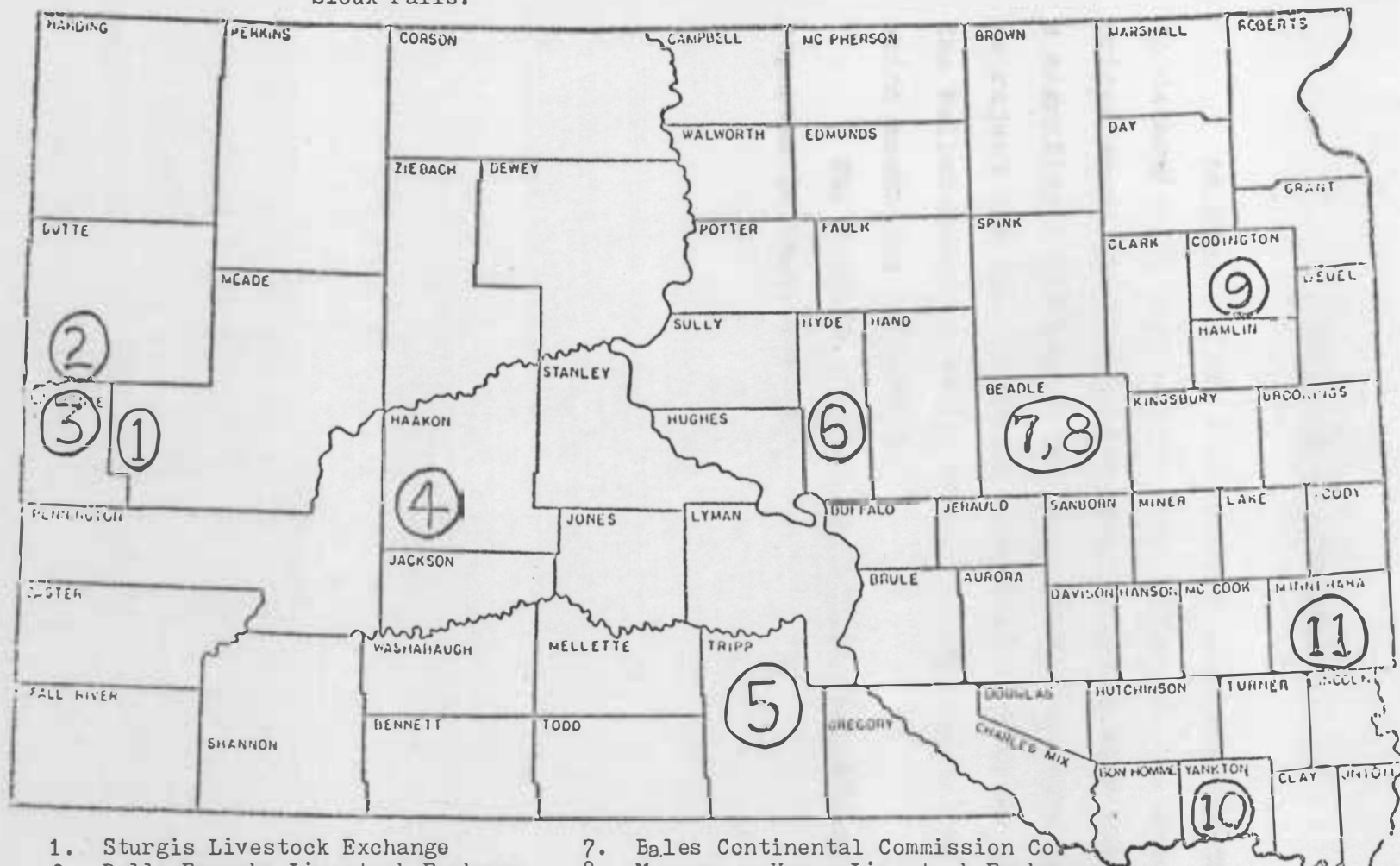
The auctions selected are as follows:

1. Sturgis Livestock Exchange
2. Belle Fourche Livestock Exchange
3. Maddens Livestock Market, Inc. at St. Onge
4. Phillip Livestock Auction
5. Winner Livestock Auction Co.
6. Highmore Livestock Exchange, Inc.
7. Bales Continental Commission Co. at Huron
8. Magness-Huron Livestock Exchange
9. Lokens Watertown Sales Pavillion
10. Yankton Livestock Sales Co.

Map 3.1 indicates the location of each of the auction sale barns in South Dakota.

Total sales of the auctions selected represent approximately 42% of all cattle sold through local auction barns in South Dakota. The auctions are located throughout the state to give a representation of both East River and West River feeder cattle prices.

Map 3.1: Locations of local auction barns providing data on feeder calf prices and the terminal market in Sioux Falls.



- | | |
|-------------------------------------|---------------------------------------|
| 1. Sturgis Livestock Exchange | 7. Bales Continental Commission Co. |
| 2. Belle Fourche Livestock Exchange | 8. Magness - Huron Livestock Exchange |
| 3. Maddens Livestock Market, Inc. | 9. Lokens Watertown Sales Pavillion |
| 4. Phillip Livestock Auction | 10. Yankton Livestock Sales Co. |
| 5. Winner Livestock Auction | 11. Terminal Market - Sioux Falls |
| 6. Highmore Livestock Exchange | |

Analysis of Variance

An analysis of variance was performed on the data to determine if any significant difference occurred in prices among marketing alternatives for feeder cattle. If a significant difference appears among the price means, and we reject the null hypothesis that all the means are equal, the Waller-Duncan k-ratio t-test is implemented to test which means are different.

The results of the statistical analysis are reported in Chapter Four.

Selected marketing alternative price means have been analyzed in subsequent chapters for the years 1973-1982, and in feeder cattle for the years 1973-1985. The results of the statistical procedure used in this report are included in this chapter.

MARKETING ALTERNATIVES

The results of this investigation are presented in the analysis of price data collected from the following marketing alternatives: direct sales through brokers, commission sales through brokers, and direct sales through auction. The data were analyzed with the ANOVA procedure of variance analysis to determine if there were any significant differences in price among the three marketing alternatives.

Chapter Four

Results

The general objective of this study was to determine if differences in price exist in the various marketing alternatives available to beef producers. A general hypothesis would be:

H_0 : The price means of the marketing alternatives are the same.

H_R : At least one of the marketing alternative price means is different from the rest.

Selected marketing alternative price means have been analyzed on slaughter cattle for the years 1973-1982, and on feeder cattle for the years 1978-1982. The results of the statistical procedure follow in the next two sections of this chapter.

Slaughter Cattle

The results of this investigation are based upon the analysis of price data collected from the following market channels: Sioux Falls Terminal Market, composite direct buyer price for South Dakota, and five futures contract options. The data were analyzed with the SAS analysis of variance (ANOVA) procedure in an attempt to determine if differences exist among the mean prices of the marketing

alternatives. A "post hoc" procedure called the Waller-Duncan k-ratio t-test was also implemented to assist in defining where differences occur if the ANOVA procedure indicated a significant difference was present.

The null hypothesis and research hypothesis for this study of slaughter cattle marketing alternative price means are:

H_0 : The price means of seven marketing alternatives for slaughter cattle are the same.

H_p : At least one of the price means of the seven marketing alternatives for slaughter cattle is different from the others.

The mean price of each marketing alternative is as follows:

Terminal Market	-----	52.05
Direct Buyers	-----	52.71
Future Contract 1	-----	52.18
Future Contract 2	-----	52.44
Future Contract 3	-----	52.73
Future Contract 4	-----	52.31
Future Contract 5	-----	53.28

The complete ANOVA analysis utilized the seven marketing alternatives and ten years of monthly data. A total of 840 observations were in the data set. Sources of price variation in the complete model were: marketing alternatives, months, years, alternatives x months, alternatives x

years, and years x months. This complete model included three interaction terms: alternatives x months, alternatives x years, and years x months. Interaction terms are utilized to identify variation in the model that is not attributable to the main effect terms of marketing alternatives, months, and years, or to error variance. Also, two of the interaction terms will be used later in this study as error terms in follow-up tests of the complete model.

The results of the analysis of the complete model are illustrated in Table 4.1 which follows:

Table 4.1: ANOVA of Complete Model With Price as Dependent Variable

Source	df	SS	MS	F
Model	245	119,532.0437	487.8859	41.20**
Error	594	7,033.2311	11.8405	
Total	839			

** indicates significant at .01 level

These results indicate that at least one of the sources of variation utilized in the model was significantly different from the rest. It still does not identify where the difference occurs so follow-up tests were performed to define differences.

Prices of slaughter beef over time have historically varied so it would seem reasonable to expect large variations in price over the years. Hence, an extension of

the ANOVA test was performed to determine if the prices did vary over the months and years. The results of this test using months as the treatment effect and years x months as the error term are presented in Table 4.2. These results will indicate whether a significant difference exists in prices of slaughter cattle over time.

Table 4.2: ANOVA Test of Price Differences Over Time

Source	df	SS	MS	F	PR F
Months	11	1131.2667	102.8424	3.12**	0.012
Years x Months	99	3263.5540	32.9652		

** indicates significant .01 level

The conclusion regarding this procedure is that the prices of slaughter cattle for all marketing alternatives do significantly vary over time according to the data analyzed in this study. The critical value of F_{99}^{11} (.01) is 2.43 and the calculated F ratio for the test data is 3.12 which indicates a highly significant difference in the price means over time. The conclusion is that the slaughter beef producer can expect the price to significantly vary over the months and years.

To test the hypothesis of this study as to whether the price means of marketing alternatives differ, another extension of the analysis of variance procedure was performed. In this "post hoc" analysis, marketing alternatives

were used as the treatment effect and alternatives x years was used as the error term. ANOVA Table 4.3 illustrates the results of this diagnosis. The purpose of this test is to remove variation in prices over time and compare the variation caused by only the marketing alternatives.

Table 4.3: ANOVA of Marketing Alternatives for Slaughter Cattle

<u>Source</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F Value</u>	<u>PR F</u>
Alternatives	6	125.3577	20.8929	0.17	0.9839
Alternatives x years	54	6661.6012	123.3630		

* indicates significant at .05 level

The results of this analysis of variance procedure indicate that there is not enough evidence to reject the null hypothesis that all the marketing alternative price means are equal. That is, no significant difference exists in prices among the seven marketing alternative data sets analyzed. The critical value of F_{54}^6 (.05) from the F table is 2.25 and the calculated F is 0.17 which indicates that no significant differences were present in the test.

The implications for the South Dakota slaughter beef producer from the analysis of the preceding data indicate that although prices of slaughter beef vary over the months and years, there is no difference in which marketing channel is chosen. This implies that the slaughter beef producer could take advantage of the price differences over time by

utilizing forward contracting if the forward price met the expected price for the beef. The use of a framework for evaluating alternate market channels could allow the producer to reduce risk by utilizing futures contracts even before cattle were placed in the feedlot. In addition, the beef producer has the opportunity to evaluate the forward price throughout the feeding period with confidence that the marketing alternative selected is as good as the rest.

If the slaughter beef producer desires to reduce risk and maximize profit, it is necessary to develop a marketing plan to evaluate the proper time to market the cattle. The results of this evaluation of slaughter beef cattle verify that timing of the marketing process can significantly influence the price received. Suggestions on developing a marketing plan are included in Appendix A of this paper.

Feeder Cattle

The objective of the study of price data collected on feeder calf sales in South Dakota was to determine if price differences existed between the selected marketing alternatives.

The marketing alternatives selected were: the Sioux Falls terminal market, five futures options, and ten local auction barns located throughout South Dakota. This totals to sixteen different marketing alternatives and

monthly price data were collected from each channel for five years, 1978-1982. The total number of observations in the data set numbered 960 and were analyzed using the SAS analysis of variance (ANOVA) procedure.

The null hypothesis and research hypothesis are stated as:

H_0 : The price means of the sixteen marketing alternatives for feeder cattle are the same.

H_r : At least one of the sixteen marketing alternative price means is different from the rest.

The price mean of each of the feeder calf marketing alternatives for the five year period is as follows:

Auction 1	-----	75.03
Auction 2	-----	75.94
Auction 3	-----	76.36
Auction 4	-----	76.78
Auction 5	-----	71.25
Auction 6	-----	75.86
Auction 7	-----	71.43
Auction 8	-----	69.76
Auction 9	-----	74.37
Auction 10	-----	70.50
Future 1	-----	68.60
Future 2	-----	69.03
Future 3	-----	69.52
Future 4	-----	70.09
Future 5	-----	71.01
Terminal	-----	74.43

A complete model ANOVA analysis was performed first to determine if there were differences present in the sources of price variation. The complete model of sources of variation were: marketing alternatives, months, years, alternatives x months, alternatives x years and years x months. This complete model, which includes all the above mentioned terms, includes three interaction terms: alternatives x months, alternatives x years, and years x months. The interaction terms are used to identify variation in the model that is not attributable to the main effects of alternatives, months, and years, or to unexplained error. It allows the researcher to identify factors other than main effects which may cause the price means to vary.

One of the interaction terms is used later in this analysis to act as error terms in testing hypothesis about specific differences in marketing alternatives.

The results of the ANOVA test of the complete model are illustrated in Table 4.4 which follows:

Table 4.4: Analysis of Variance Table of Complete Model of Feeder Cattle Prices

<u>Source</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>	<u>PR F</u>
Model	299	128,519.7947	429.8321	32.51**	0.0001
Error	660	8,725.0261	13.2197		
Total	959	137,244.8208			

** indicates significant at .01 level

The results of this procedure indicate that a significant difference exists among the sources of variation. However, it does not indicate which of the sources of variation (one or more) is causing the difference. In order to more closely examine the data, further tests must be enacted.

The first additional test performed using ANOVA was to see if price differences occurred over time. An analysis of the months and years indicate, as it did in slaughter cattle, that significant variation occurs in the prices of feeder cattle over time. See ANOVA table 4.5 for the results of the test.

Table 4.5: ANOVA Results of the Main Effect Variations of Alternatives, Months and Years

Source	df	SS	MS	F	PR F
Alternatives	15	8,827.05	588.47	44.51**	0.0001
Months	11	1,127.12	102.47	7.75**	0.0001
Years	4	84,670.87	21,167.72	1601.22**	0.0001
Error	660	8,725.03	13.22		

** indicates significant at .01 level

The F values in Table 4.5 are sufficiently high to conclude that a highly significant difference occurs in the prices of feeder cattle over the months and years. In addition, this test provides evidence that the prices of feeder cattle vary significantly according to the marketing

alternative selected. This implies that feeder cattle producers can improve their mean price received by selecting the proper market channel.

To further test the hypothesis regarding differences in prices of feeder cattle, an extension of the ANOVA procedure was used to test the alternatives using the interaction term, alternatives x years, as an error term. This test, in effect, removes the yearly variation in price and compares the variation only among the marketing alternatives. The results are presented in Table 4.6.

Table 4.6: Results of ANOVA Test of Marketing Alternatives for Feeder Cattle

Source	df	SS	MS	F	PR F
Alternatives	15	8827.0516	588.4701	2.69**	0.0035
Alternatives x years	60	13149.9023	219.1650		

** indicates significant at .01 level

The critical value of F_{60}^{15} for this analysis is 2.35. Since the calculated F is 2.69 and exceeds the table value, we reject the null hypothesis that no differences in price means of marketing alternatives exist, and accept the research hypothesis that there are differences in prices received by feeder cattle producers according to market channels selected.

To further examine this data and determine where

the differences exist in marketing alternatives another "follow-up" test was performed. The Waller-Duncan k-ratio t-test was selected to provide information on significant differences among the marketing options. The outcome of this test is reproduced in Table 4.7 and interpretation of the results follows the table.

Table 4.7: Waller-Duncan k-ratio t-test for Dependent Variable Price

Means with the same letter are not significantly different.

<u>Waller Grouping</u>					<u>Mean</u>	<u>N</u>	<u>Marketing Alternative</u>	
	A				77.25	60	Auction 5	
B	A				76.78	60	Auction 4	
B	A	C			76.36	60	Auction 3	
B	D	A	C		75.94	60	Auction 2	
B	D	A	C		75.86	60	Auction 6	
E	B	D	A	C	75.03	60	Auction 1	
E	B	D	A	C	F	74.43	60	Terminal
E	B	D	A	C	F	74.37	60	Auction 9
E	B	D	A	C	F	71.43	60	Auction 7
E	B	D		C	F	71.02	60	Future 5
E		D		C	F	70.50	60	Auction 10
E		D			F	70.09	60	Future 4
E		D			F	69.76	60	Auction 8
E					F	69.52	60	Future 3
E					F	69.03	60	Future 2
					F	68.60	60	Future 1

k-ratio = 100 (indicates significance of .05)

Minimum Significant Difference = 6.22

The usefulness of the Waller-Duncan test is to differentiate among the price means and show where the variance in price occurs. The columns beneath the Waller Grouping indicate groups of price means that are not significantly different. Columns of letters that are identical show price means that do not exceed the minimum significant difference of 6.22. The minimum significant difference refers to the range in price allowable for the means to nonsignificantly differentiate from one another. For example, if the highest mean price of 77.25 has 6.22 subtracted from it, a price of 71.03 is obtained. All marketing alternative price means in the price range of 77.25 to 71.03 are considered to be equal. This is consistent with the Waller Grouping where all the letters are A. The same holds true for groups B, C, D, E and F, all of the price means within each group do not vary more than \$6.22.

To interpret the results of the Waller-Duncan test and determine where the differences in price occur between marketing channels, it is necessary to do individual calculation using the minimum significant difference number of 6.22 and the letter grouping of means (means that are not significantly different). The letter groups of means are not necessarily different from one another because the groups all have some price means in common. If the letter groups did not have any price means in common then it could be said

that the groups differ significantly but in these results all of the Waller Groupings have several price means that are the same. The use of the minimum significant difference number allows the interpretation of comparisons of individual marketing alternatives.

In examining the results of differences within and between each of the major marketing alternatives, terminal markets, auction sale barns, and futures contracts, some differences are noted.

The terminal market is not significantly different from any of the other marketing alternatives in price mean. If the significant difference number of 6.22 is both added and subtracted from the terminal mean price of 74.43, a range of 80.65 to 68.21 is established. All of the other marketing alternative price means fall within this range so it can be concluded that no difference exists among the price means. The producer of feeder calves could, within limitations of this data set, with confidence sell feeder calves at the terminal market at a particular time period and expect to receive no significantly different price than the other marketing channels studied. It should be noted, however, that the study also provided information that differences in prices did exist over time, which means that the use of futures markets in a different time period may be useful in expanding profit. Another consideration would be cost of transporting feeder calves to the market. The

producer of feeder calves must consider the transportation cost in determining the net price received. A discussion of transportation and marketing costs is included in Appendix A.

Within the local auction barn alternatives, several differences can be noted. The highest numerical price mean is Auction 5 at 77.25. If the minimum significant difference of 6.22 is subtracted from 77.25, a range of 77.25 to 71.03 is established. Within this range of price means, no significant difference is present among the local auction sales barns. It can be concluded that auction barns 1, 2, 3, 4, 5, 6, 7, and 9 which are in the above price range, have similar mean prices. The auction barn alternatives of 8 and 10 have price means of 69.76 and 70.50 respectively, which are both lower than the minimum significant number of 71.03 and indicates that both are significantly lower in mean price than Auction 5.

In further examination of the auction barn alternatives, if 6.22 is subtracted from the mean price of Auction 3, ($76.36 - 6.22$) a minimum significant price of 70.14 is established. The mean price of Auction 8 is 69.76 which is lower than the minimum significant price of 70.74. From this it can be concluded that Auctions 3, 4 and 5 are significantly higher in price than Auction 8.

Among the future contract alternatives, no difference in price exists according to interpretation of the

results of the Waller Grouping. All of the mean prices for the five futures options are included in group F of the Waller Grouping. This indicates that the futures prices are not significantly different from each other.

Between marketing alternatives, several differences were implied by this data analysis. By again using the highest mean price of 77.25 at Auction 5 and subtracting the minimum significance number of 6.22 ($77.25 - 6.22$) we obtain a minimum significant price of 71.02. Price means falling below 71.03 would be significantly different from Auction 5's price mean. The results infer that the mean price received by feeder calf producers at Auction 5 are significantly higher than the prices paid at Auctions 8 and 10, and Futures 1, 2, 3, 4 and 5. However, there are some non-price differences which may account for the deviations in price. Such items as quality of calf, breed, handling, fees, and feeding can have an effect on price received. Transportation costs may also contribute greatly to the net price difference.

Similar mathematics can be performed for each of the marketing alternatives. For example, if 6.22 (minimum significance number) is added and subtracted from the Auction 1 price of 75.03, a minimum significant price range of 81.25 to 68.81 is established. Any of the price means falling outside of this range are significantly different. If the means in Table 4.7 are examined it can be seen that

the price mean of Future 1 (68.60) is significantly different from the price mean of Auction 1. All other price means are in the non-significant range.

The results of the analysis of variance testing of the price data for marketing alternatives for feeder calf producers indicates that several differences exist both in marketing channels and prices over time. This suggests that the feeder calf producer should utilize a market planning system to evaluate both the prices at marketing channels available and the most optimum time to market. While the futures market options appear to have the lowest mean price, the time factor price changes allude to possible risk reduction if a goal price could be satisfied with a future contract. A possible market analysis procedure is discussed in Appendix A.

Chapter Five

Summary, Conclusions, Limitations and Recommendations

Beef producers in South Dakota market slaughter cattle and feeder calves under a great deal of risk and uncertainty. One way to reduce the risk and uncertainty is to be able to accurately forecast future prices. Another way is to be able to evaluate marketing alternatives and have the ability of select the proper marketing channel for a particular marketing period.

Summary

The major concern of this study was to determine if price differences exist between marketing alternatives for both slaughter cattle producers and feeder calf producers.

Specific objectives were:

1. To collect and analyze price data for slaughter cattle from the terminal market, direct buyers, and five futures contracts for a ten year period, 1973 - 1982, and determine if price differences occurred between the alternative marketing channels.

2. To collect and analyze price data for feeder cattle from the terminal market, five futures contracts and ten local auction barns for a five year period, 1978 - 1982, and determine if price differences exist between the marketing alternatives.

Analysis of variance (ANOVA) procedures were utilized to first, determine if a difference existed among the mean prices of marketing alternatives; and second, if differences in mean prices were present, ascertain where the differences may have occurred and identify the marketing channel(s) which were different. Ten years of monthly price data was analyzed for the slaughter cattle prices and five years of monthly data was analyzed for the feeder cattle prices.

Conclusions

Slaughter Cattle

Statistical analysis of the slaughter cattle prices over a ten year period indicated that no significant difference in prices of the marketing alternatives were present. A total of seven marketing alternatives were tested: the Sioux Falls Stockyards Terminal Market, direct buyer prices for South Dakota, and five future contract options. The futures contracts started at 30 days

before putting cattle in the feedlot, another at 30 days after cattle are in the feedlot, a third option at 150 days before market, the fourth at 60 days before marketing, and the fifth at the marketing month.

Although the results of the analysis indicated that no difference was present in the mean price of the marketing alternatives, there was a significant difference in the price over time. This infers that the producer should be analyzing his marketing opportunities even before purchasing cattle for the feedlot. A system or framework for evaluating the various marketing alternatives would assist in reducing the cattle feeding risk and uncertainty. Time is an important factor in the prices of beef cattle and the beef feeder must consider this in his total marketing plan and not wait until the last 30 days of the feeding period to consider marketing alternatives. The time to have concern for price should start before purchasing cattle for the feedlot. Suggestions on how to accomplish an evaluation are included in Appendix A.

Feeder Cattle

Analysis of variance procedures were used for the price data collected on feeder calf alternative markets over a five year period (1978-1982). A total of sixteen marketing alternatives were tested: the Sioux Falls Terminal Market, ten local auction barns located throughout South

Dakota, and five future contract times. The first future contract was selected at about 30 days before calves are born. A second future contract was priced 31 days after calves are born, the third at 150 days before marketing, a fourth 60 days before marketing, and the fifth the month of marketing.

The conclusions of the statistical procedure (ANOVA) imply that significant differences are present in two areas, price over time and between some marketing alternatives.

As could be expected, the study provides evidence that the prices of feeder cattle do vary significantly over time. The prices rise and fall considerably, probably due to such factors as supply, demand and prices of substitutes. Because of the price fluctuations the producer of feeder cattle would likely reduce risk if a market evaluation system were available and utilized. A presentation on market evaluation frameworks is included in Appendix A.

The second area of significance that is revealed by the process of ANOVA is differences that are present between marketing alternatives for feeder cattle. A significantly different price was revealed between some of the auction markets and there were significant differences in price between some auction markets and some futures contracts.

The implications for feeder calf producers are:

1. Analyze the feeder cattle future prices several times starting before calves are born and if the future price meets or exceeds a goal price, consider the futures contract.
2. If selling at an auction barn, diagnose prices from other auction barns in the area to determine if a higher net price can be obtained (after examining differences in marketing costs and transportation costs).
3. Develop a total market analysis system to determine profitability of marketing alternatives.

Risk and uncertainty can quite probably be reduced if the feeder calf producers follow the above suggestions and evaluate marketing alternatives on a regular basis.

Limitations

Only one terminal market is present in the state of South Dakota so a comparison between terminals was not present. The terminal market is located in the southeastern part of South Dakota. This location prohibits many producers from marketing at the terminal market because of excessive transportation costs and eliminates this as an alternative.

Only ten selected auction markets were studied for prices of feeder cattle. Many auctions have changed ownership several times and lack of adequate data prevented their use in the comparisons. A survey of price data from all auction barns would be most desirable. Although approximately 8 percent of the slaughter cattle are marketed through auction barns, the data are sporadic and it was not possible to obtain meaningful monthly mean prices for slaughter cattle so this alternative could not be used for cattle being slaughtered.

The direct buyer price for slaughter cattle is a composite of all direct buyers. It was not possible to obtain separate prices from the various direct buyers. A comparison of the prices offered by individual direct buyer organizations may have been useful.

Futures trading on the feeder cattle market is a relatively new marketing alternative. Because of limited use of the forward contracting of feeder cattle, by producers, the effectiveness may be restricted. The capability of feeder calf producers to utilize this market channel successfully will probably improve with increased usage.

Recommendations for Further Research

This study has provided information on marketing alternatives for South Dakota beef producers regarding

slaughter cattle and feeder cattle. The research has shown that differences exist over time for both slaughter and feeder cattle and that there are differences in prices of certain marketing alternatives for feeder calves.

A new futures option on agricultural commodities will be implemented in the fall of 1984. An option will be available on live cattle and could be a basis for additional research on slaughter cattle marketing alternatives.

Research could also be implemented on testing a marketing evaluation system that could be used by beef producers. The research could include a study of training needs to enable farmers to do their own evaluation of the market channels.

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A PROPOSED MARKET EVALUATION SYSTEM FOR BEEF PRODUCERS

Introduction

Beef producers generally market their slaughter cattle and feeder calves in open competitive markets where they have little control over the selling price. When the producer decides to sell the cattle offered in the open market,

APPENDIX A

A PROPOSED MARKET EVALUATION SYSTEM FOR BEEF PRODUCERS

The marketing plan for slaughter cattle is generally set by the cattle dealer market and holding the cattle until they are sold. The dealer sets the "open weight" and offers the cattle to the market at whatever price is offered. Feeder cattle producers have more alternatives for selling their calves but are restricted by feed supplies and facilities available. As they are sold at market, a certain price and weight value is offered.

A market evaluation system should hold the producer and not be subject to the marketing situation rather than being to "take" the price offered. The market evaluation should define the role and responsibility of marketing cattle and calves as an individual firm. Knowledge of a market evaluation system may benefit the beef producer and help guide the individual marketer in making alternative marketing decisions. Marketing variables such as feed costs, off



A PROPOSED MARKET EVALUATION SYSTEM FOR BEEF PRODUCERS

Introduction

South Dakota beef producers generally market their slaughter cattle and feeder calves in open, competitive markets where they have little control over the selling price. When the producer decides to sell, the price offered is the price received.

The "marketing time" for slaughter cattle is generally when the cattle reach market weight and holding the cattle longer is not a feasible option as they will be "over weight". This often forces the cattle feeder to accept whatever price is offered. Feeder cattle producers face more alternatives for selling time but are restricted by feed supplies and facilities available, so they may have to market at a certain time and accept whatever price is offered.

A market evaluation system should help the cattlemen have more control of the marketing situation rather than having to "take" the price offered. The market evaluation should reduce the risk and uncertainty of marketing cattle and calves at an undesirable time. Advantages of a market evaluation system are: helping the beef producer set target prices, identifying acceptable market alternatives, planning production, determining variable and fixed costs, and estimating income.

An important factor in development of a market planning system is forward contracting of beef. Forward contracting can provide some freedom in marketing. The widely changing beef prices over time cause price volatility and risk that can be reduced if a forward market meets or exceeds a "target price" for the beef producer. Taking advantage of the various marketing alternatives requires a knowledge of how to use all of the opportunities and the framework presented here can assist in decision making.

Marketing Strategies

A marketing plan or evaluation cannot be successful unless strategy is considered to fulfill goals. Strategies should consider such areas as business goals, personal goals, financial situations, and attitudes toward risk. While there are many strategies, some of the common ones for beef producers are:

1. Achieve a "reasonable" profit.
2. Meet cash flow needs.
3. Cover variable and fixed costs.
4. Market the cattle and calves on an upturning market.
5. Achieve a higher than average yearly price.
6. Change the marketing strategy if necessary.

Recognizing Marketing Opportunities

An effectual producer should have the ability to

recognize market alternatives available and be able to discern which are most advantageous. In order to efficiently achieve a marketing goal, the beef producer must attain skills in several areas. Some of the more important abilities are discussed in the following paragraphs.

It is necessary for the producer to know costs, both variable and fixed, in order to set target price goals for the beef product being marketed. After the cost and target price are determined, a producer also should have the ability to make a selling decision. Marketing and production decisions should be made together and not at different times. Too often production decisions are made on tradition, preference, or convenience and not on profit.

To compare marketing alternatives requires a commitment and dedication to acquiring information needed for evaluation. The evaluation system should be recorded and modified as new information is received. The evaluation forms which follow are guides as to how a system can be established. Modification of the forms should be done if the beef producer needs to refine the system.

Evaluation Form 1 is intended to be used to record prices that can be received from various marketing channels. The form is designed to help determine a net return from each marketing alternative. Under the first column, the various ways cattle can be marketed are listed. The individual farmer would list all that are applicable to his

operation. The second column lists the weight of the beef animal and would be the same for all alternatives. The third column would denote the price per pound received for cattle at each market. Column four is total dollar returns and is calculated by multiplying column two times column three (2×3).

The total cost of production is written in column five. This cost can be determined either from actual production costs or a realistic budget for production.

Marketing costs are listed for each marketing alternative in column six. Marketing costs consist of such items as: veterinary fees, yardage, commission, check offs, basis, shrink, and any other marketing fees that might be assessed. Actual transportation costs to market can be enumerated under column seven for each of the marketing channels.

By subtracting all costs from the total returns (column 4 minus columns 5, 6 and 7) a net return can be determined from each marketing channel. To determine only differences between marketing alternatives, the farmer would subtract the sum of columns six and seven from column four (column 4 minus columns 6 and 7). From this the beef producer can see actual dollar differences between the marketing alternatives.

Evaluation Form 2 is a sample of a way to evaluate production possibilities and determine a target price. The

beef producer denotes the year and type of cattle at the top of the form and would use a form for each different group of cattle. Line one lists the projected number to be fed or raised. Line two is divided into four parts; variable costs, fixed costs, total costs and profit objective, and is figured on a per pound basis.

Line three is where the expected market weight is denoted, and line four is where the personal target price is written. The probable month of sale of the animals is listed on line five.

The total cash receipts per head are determined on line six by multiplying line 3 times line 4 (line 6 = line 3 x line 4). Total cash receipts for the group of cattle can be figured on line seven by multiplying line one times line 6 (line 7 = line 1 x line 6). The last line, number eight, when calculated should give the beef producer an estimation of receipts needed to cover cash costs. Line eight is derived by multiplying line one times line 2c (line 8 = line 1 x line 2c).

Once an evaluation system or marketing plan is established, it is quite likely to be refined after each year of use. The second year plan will be more useful and accurate than the first and so on. No single marketing evaluation system is likely to fit every beef operation. Plans must be tailored to fit each individual beef operation and should be flexible to allow changes if needed.

Evaluation Form 1 (example)

EVALUATION OF MARKETING ALTERNATIVE PRICES

1	2	3	4	5	6	7	8
<u>Marketing Alternative</u>	<u>Weight</u>	<u>Price per lb.</u>	<u>Total Returns</u>	<u>Total Production Costs</u>	<u>Marketing Costs</u>	<u>Transportation Costs</u>	<u>Net Returns</u>
Current Price	_____	_____	_____	_____	_____	_____	_____
Future 1	_____	_____	_____	_____	_____	_____	_____
Future 2	_____	_____	_____	_____	_____	_____	_____
Future 3	_____	_____	_____	_____	_____	_____	_____
Future 4	_____	_____	_____	_____	_____	_____	_____
Future 5	_____	_____	_____	_____	_____	_____	_____
Direct Buyer	_____	_____	_____	_____	_____	_____	_____
Terminal	_____	_____	_____	_____	_____	_____	_____
Auction 1	_____	_____	_____	_____	_____	_____	_____
Auction 2	_____	_____	_____	_____	_____	_____	_____
Auction 3	_____	_____	_____	_____	_____	_____	_____
Auction 4	_____	_____	_____	_____	_____	_____	_____
Auction 5	_____	_____	_____	_____	_____	_____	_____



Evaluation Form 2 (example)

Marketing Plan ¹: _____ Year _____ Commodity

1. Projected production (number of head) _____
2. Price necessary per pound to:
 - a. Cover variable costs _____
 - b. Cover fixed costs _____
 - c. Cover total costs _____
 - d. Meet profit objective _____
3. Expected market weight _____
4. Personal price target (per pound) _____
5. Probable month of sale _____
6. Total cash receipts per head at personal target price (line 3 x line 4) _____
7. Total cash receipts received at personal target price (line 1 x line 6) _____
8. Cash receipts needed to cover total cash costs (line 1 x line 2c) _____

¹ Adapted from "Developing a Marketing Plan", Norman Tolman and Hugh McDonald, Cooperative Extension Bulletin EC-809. September 1983.