The effects on costs and returns of varying size and organization of farm feedlots in Montana
by Robert Gustav Mueller

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE in Agricultural Economics
Montana State University
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Abstract:
The research problem is concerned with economies of farm feed-lots in Montana. Of interest are the relationships of output to changes in' variable inputs. Selected inputs of feeding were varied to establish their effects on costs and net income. The input variations primarily took the form of varying the number of cattle fed in a given period of time plus some equipment additions.

The method used to establish the effects of varying the inputs used in feeding was to initially set up four hypothetical farm feedlots of different sizes, judged as being representative of feeding as it exists in Montana. The data used in determining the inputs and costs incurred in feed-, ing were obtained through interviews with 55 farm feeders in nine Montana counties.

A general conclusion from this study is that minor economies do occur in Montana's farm feeding as it exists today. These economies appeared with increased utilization of the existing facilities for feeding. When the numbers of cattle fed were increased without changing the feeding facilities, non-feed costs per head were reduced. Similarly, minor equipment additions also reduced non-feed per head costs.

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by

ROBERT G. MUELLER

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree

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ABSTRACT

The research problem is concerned with economies of farm feedlots in Montana. Of interest are the relationships of output to changes in variable inputs. Selected inputs of feeding were varied to establish their effects on costs and net income. The input variations primarily took the form of varying the number of cattle fed in a given period of time plus some equipment additions.

The method used to establish the effects of varying the inputs used in feeding was to initially set up four hypothetical farm feedlots of different sizes, judged as being representative of feeding as it exists in Montana. The data used in determining the inputs and costs incurred in feeding were obtained through interviews with 55 farm feeders in nine Montana counties.

A general conclusion from this study is that minor economies do occur in Montana's farm feeding as it exists today. These economies appeared with increased utilization of the existing facilities for feeding. When the numbers of cattle fed were increased without changing the feeding facilities, non-feed costs per head were reduced. Similarly, minor equipment additions also reduced non-feed per head costs.

CHAPTER I

INTRODUCTION

The Problem Situation

American Agriculture is facing a constantly changing pattern of economic conditions. In this environment the farmer or rancher is presented with a challenge of anticipating changing economic conditions and the making of rapid adjustments in the combination of factors of production necessary to remain solvent.

In general, there are two problems in farm business survival facing the manager. One is that in the short run he must avoid insolvency. Schickele considers this to be an income sufficient to cover the variable costs of the farm and the relatively fixed family living expenses.1/ The second problem is to secure an adequate profit from the farm over time. Ideally, this would be an income sufficient to support a family at acceptable standards of living under conditions of long-time average yields, and replace the farm's durable equipment. These two problems are usually complementary. However, they may not be if bankruptcy threatens. For example, soil conservation practices may have to be temporarily suspended in order to remain solvent, which in the long run may reduce profits.

In an effort towards diversification and the maintenance of farm income, farmers and ranchers in the surplus feed grain areas of the West are increasingly undertaking some form of beef cattle feeding. At present, in

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1/ Rainer Schickele, "Farm Business Survival Under Extreme Weather Risks", Journal of Farm Economics, Proceedings, Vol. 31, No. 4, Nov., 1949.

the Northern Plains and Mountain States, beef finishing is in its infancy as compared to other feeding areas. One of the possible explanations for the industry's slow progress within the area is the lack of knowledge on the part of the farmer concerning the organization and management of resources used to successfully finish cattle for slaughter. It is hoped that this study will help individuals interested in beef feeding arrange their resources in such a manner that they can predict within close limits the outcome of their production, and make valid conclusions regarding any possible future expansion.

For existing and prospective Montana cattle feeders the problem is one of deciding what size the farm feedlot should be to fit in with the farm and yield the greatest income to the farm unit. A parallel with the problem of feedlot size is the problem of what additional facilities have to be purchased to do an adequate job of feeding.

The usual criterion for increased economic efficiency is the maximization of net returns. This involves a consideration of both economic and physical relationships. In the usual type of economic analysis, the production function is assumed as known and given. Then, with given and fixed product and factor price relationships the selection of economic optima is a matter of simple calculus.[1/] The economist can then determine the product and factor combinations to be sought and the level of intensification of each enterprise.

In actual production management the solution to problems in resource

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1/ Henderson and Quant, Micro-Economic Theory, New York, McGraw-Hill Co., 1958, Chapter III, and Sune Carlson, A Study on the Pure Theory of Production, New York, Kelley and Millman Co., 1956, Chapter IV.

use are not as simple as theory indicates. For example, the theoretical assumption that a production function is clearly defined is not always applicable to real situations because the designation of the best physical resource relationships is difficult to formulate. Frequently the data necessary to define the best physical relationships is not available and the economist has to work with incomplete or oversimplified data. Consequently, a production economics study should consider both aspects--the science of production management and the relevant economic factors.1/

Cognizance of the fact that there exists a lack of complete detail necessary to apply formal maximization procedures to problems of resource use does not leave marginal analysis nonoperative. The conceptual framework contains a logical consistency for the formulation of hypotheses which guide the researcher toward a possible solution to the problem. Profit maximization being the criterion for efficiency, the theoretical constructs of marginal analysis provide a pattern in the delineation of economic allocation problems for particular alternatives. These alternatives are fabricated for a firm in cognizance of the physical, economic, and institutional environment within which production occurs.

Conventional theory, while providing an analytical framework, is limited in that an actual analysis and investigation of resource use situations suggest use of a technique which brings the abstract theoretical concepts and the available data together. Variants of the methods of budgeting provide such a technique.

1/ Optimally, an economist and a production management analyst should cooperate on such a problem.

When a shift is made in a farm's enterprise system, a reallocation and recombination of factors of production occurs, adding some and liquidating others, so as to produce more of one product. A farm operator comtemplating a shift towards a finishing enterprise or an intensification of an already existing feeding enterprise, is concerned with the possible loss of income between the time old assets are liquidated and newly acquired assets produce income. This may necessitate financing of some sort. A borrower places himself under the "principle of increasing risk" which reflects the fact that as a farmer's proportional equity in his enterprises decreases as borrowing is increased, the risk of that equity being wiped out by price fluctuations is also increased.

Review of Literature

Popular Literature

In recognizing the need for information regarding the organization, management, cost and returns of farm feedlots, publishers of farm and other magazines have responded with numerous articles. Of these, only one has been selected as representative.1/

The author, Mr. Carmody, makes no attempt at an economic study other than the expression of various management practices the subject feedlot is using to feed cattle for profit. The title "Hot Feed" is indicative of the fairly recent practice of fattening cattle on a ration very high in energy.

The subject feedlot was a large one in Phoenix, Arizona with a capacity of 12,000 head and a monthly turnover of 3,000 head. The article was written primarily for cattle feeders of all types, but in such a manner that interest might be stimulated in other readers as well. This was accomplished by choosing several problems of cattle feeding and stating how the feedlot owners solved these problems with various labor-saving, feeding and marketing practices. An important point mentioned in the article was that very often output can be increased substantially merely by increased utilization of existing facilities, thereby decreasing non-feed per head costs.

Although the subject feedlot is very large compared to Montana feedlots, a few points were applicable to Montana's farm feeders. One of the

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1/ Robert Carmody, "Hot Feed", The Farm Quarterly, Summer, 1961, pp. 90-95.

owners of the subject feedlot was quoted as saying,

> "Too many farmers take the attitude that the only reason for feeding cattle is to market their hay and grain, and they feed it without too much thought as to its nutritional quality. Another angle a farmer might consider is to feed the cheap roughage gains himself and then put on the finishing gains at a reputable feedlot. Thirdly, farmers should learn to be more cost conscious. In many instances farmers fail to recognize their own labor and other non-feed costs as part of their actual production expenses."

Regardless of the interest which the article may be capable of generating, it falls short of giving a prospective or the operating farm-feeder the information necessary to evaluate the economic position of a feedlot on his farm. The author failed to recognize the capital limitations under which most farmers operate or the fact that cattle feeding tends to conflict with other farming operations when feeding is intensified. No effort was made to determine the costs involved in feeding with limited knowledge of feedlot practices, or the speculative nature of the business due to frequent price variation.

Professional Literature

The need for more adequate information has also been recognized by experiment stations all over the country. Many experiments have been and are being conducted dealing mainly with feeds and feeding practices. In a few instances costs and returns have been applied to these feeding studies in an effort to show the relative profitableness of alternative feeding practices. One such experiment was conducted by the University of Minnesota and the United States Department of Agriculture in 1955-1956 dealing with seventy

nine Minnesota farm feedlots.[1]

The data presented covered individual lots of cattle from purchase as feeders to sale as fat cattle. Three different feeding programs were represented:

(1) Long-fed calves,

(2) Long-fed yearlings,

(3) Short-fed yearlings and two-year olds.

Cattle on feed 240 days or less were classed as "short-fed" and those fed for longer periods as "long-fed". Cattle with an average weight of 500 pounds or less per head at purchase were classed as calves.

The prices for feed used in this study were termed as average yearly prices for 1955 and 1956. Cattle prices were compiled from the individual farmers and used in that form in the computations.

The data were presented for each individual lot in Table I, which shows the group averages for the three different classes of feeding.

At first glance of the data everything seems to be accounted for in arriving at the return from feeding figures. However, upon closer examination several questions arise. For example, fixed costs of production are considered in the publication only as an average of $4.49 per 100 pounds net gain in weight. Averages of this sort are almost meaningless when many feedlots are considered, as facilities and equipment can be very different. The main emphasis was on returns over feed cost. For example, the last item in the table states the "Return per $100 feed cost". This figure can be

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1/ University of Minnesota and United States Department of Agriculture, Feeder Cattle Costs and Returns, 1955-1956, St. Paul, Minnesota, Report No. 233, August, 1957.

TABLE I. SUMMARY OF THREE DIFFERENT FEEDING PROGRAMS IN MINNESOTA.

Item	Long-fed Calves Ave. 37 lots	Long-fed Yearlings Ave. 13 lots	Short-fed Yearlings & 2 yr. olds Ave. 29 lots
Number Head Bought	57	70	46
Days on Farm	340	304	184
Days on Pasture	46	42	12
Percent Death Loss	1.18	.3	.41
Average Purchase Weight	407	647	731
Average Sale Weight	962	1,134	1,070
Gain per Head	555	487	339
Gain per Head/Day	1.63	1.60	1.84
Pounds of Beef Produced	31,666	32,108	15,553
Feed Used/100 Lbs. Gain			
Corn	436	572	632
Small grain	34	9	18
Commercial Feed	41	50	61
Total Concentrates	511	631	711
Legume Hay	254	253	311
Other Hay	26	28	33
Total Dry Roughage	280	281	344
Corn Silage	160	426	526
Grass or Oat Silage	255	314	264
Total Silage	415	740	790
Pasture Days	8	8	4
Prices of Cattle			
Price Paid/cwt.	$18.89	$19.12	$17.38
Price Received/cwt.	21.00	21.04	18.50
Price Spread/cwt.	2.11	1.92	1.12
Cost and Returns per Lot			
Total Value Produced	$7,298.14	$8,083.36	$3,240.32
Total Feed Cost	4,975.16	6,525.52	3,351.58
Total Return Over Feed Cost	2,322.98	1,557.84	-111.26
Cost and Returns/cwt. Gain			
Value Produced	$22.44	$23.79	$21.40
Feed Costs	16.62	20.52	22.62
Return of Feed Cost	5.82	3.27	-1.22
Return Over Feed Cost from Price Spread	1.44	2.75	2.89
Return Over Feed Cost from Feeding	4.38	.52	-4.11
Return/$100 Feed Cost	139.00	128.00	98.00

misleading as costs of getting the feed to the cattle are handled in terms of averages for the 79 feedlots studied. These "plant" costs very often mean the difference between profit or loss and should be considered with the same detail as the costs of feed and cattle.

A more comprehensive study of feedlot finishing in California was published by the Bank of America in 1956.1/ The study was prepared by Dr. John A. Hopkin, who based the publication on information taken partly from public sources and partly from direct sampling of 85 operations of varying size feedlots.

Upon introducing the nature of cattle feeding in California, Dr. Hopkin dealt with the cost structure of the industry, which was the heart of the publication.

The 85 feedlots were first placed into four separate groups, depending on number of head fed during the previous year. The average number of head fed was 866 for Group I, 2,696 for Group II, 8,223 for Group III, and 26,866 for Group IV.

The first comparison, based on costs, concerned the number of head fed and it was found that daily non-feed costs vary inversely with number of head fed. A second comparison was by type of feedlot, and it was found that there were no significant differences in the daily non-feed costs per head among the four different types of operation--farm-feeders, owner-feeders, commerical feeders, and the combined owner and commercial feeders.2/

1/ Bank of America, Cattle Feeding in California, San Francisco, California, February, 1957.

2/ A commercial feeder is one who owns the feedlot, buys all the feed, but owns none of the cattle, as they are fed on a custom basis.

A third, and very important, cost comparison considered the ratio of number of head fed to total feedlot capacity among the sampled feedlots. To explore the relationship between the feeding ratio and non-feed costs the records were divided into four new groups, depending on the magnitude of the feeding ratio.1/ The average feeding ratios were .937, 1.469, 1.812 and 2.393 for the new groups I to IV, respectively, and the corresponding average daily non-feed per head costs were 11.13, 9.88, 9.17 and 8.52 cents. The importance of avoiding unused feedlot capacity is thus emphasized.

Dr. Hopkin continues by pointing out that, because the differences in average costs associated with different feeding ratios do not appear to account for all of the differences in costs that are associated with numbers of cattle fed, some economies of size exist between different size feedlots. These economies mainly take the form of specialization of jobs as the lot increases in size.

Summary

The literature presently available on cattle feeding does not lend itself greatly to answering the question, "What economies might exist in farm feedlots of varying capacities?" As mentioned before, there is much published on feedstuffs and feeding practices. The California study was quite sufficient for its purpose of analyzing the feeding industry in that state, but it doesn't help to make an economic analysis of the type of farm feeding that is practiced in Montana, outside of serving as a guide for the varied cost aspects that might appear in an economic analysis of Montana feeding.

1/ The feeding ratio consists of the number of head fed divided by the feedlot's capacity.

RISK AND UNCERTAINTY IN FEEDING[1]

It is evident that a feedlot operator is faced with several types of uncertainty. In reaching decisions on the size of the feedlot and methods of operation that will prove most profitable, the farm feeder is faced with two basic kinds of uncertainty: (1) as to the future course of product and factor prices; (2) as to the estimates of the amount of variable costs required to replace and maintain the durable equipment. The latter is a consequence of an inability to evaluate correctly the rates at which the durable items deteriorate and to predict future dates at which new technological developments may render the present equipment obsolete. In this decision-making process, the farm manager must consider two factors--the probabilities that prices or conditions will change by various amounts, and the consequences of errors in expectations of net returns. These factors will not be evaluated in the same way by all farm managers. Willingness to invest or produce in the face of a given risk or uncertainty depends largely on the magnitude of possible gains or losses, and the individual's ability and willingness to withstand adverse misfortune as well as to make profit.[2]

1/ Frank H. Knight, Risk, Uncertainty and Profit, New York, Houghton-Mifflen Co., 1921, Chapter VII. The most widely accepted definition of risk and uncertainty is given by Frank H. Knight and is as follows: "The practical difference between the two categories, risk and uncertainty, is that in the former the distribution of outcome in a group of instances is known (either through calculation, a priori, or from statistics of past experience), while in the case of uncertainty this is not true, the reason being in general, is that it is impossible to form a group of instances, because the situation dealt with is in a high degree unique. The best example of uncertainty is in connection with the exercise of judgment or the formation of those opinions as to the future course of events, which opinions (and not scientific knowledge) actually guide most of our conduct."

2/ J. R. Hicks, Value and Capital, Oxford University Press, New York, 1939, pp. 125-127.

Those who undertake feeding operations may be said to be in a continual learning situation with respect to the enterprise. With respect to any given group of feeder cattle, an operator often finds himself forced to take somewhat irreversible actions, regardless of his state of knowledge.

Johnson and Haver state that managers find themselves in one of five knowledge situations.1/ These five situations are:

> "(1) The inactive situation in which available information is inadequate for a decision concerning a contemplated action and in which the cost of acquiring more information exceeds its value, (2) the learning situation in which available information is inadequate for a decision and in which the value of acquiring knowledge exceeds its cost, (3) the forced action situation in which available information is inadequate but in which action is forced by outside circumstances, (4) the subjective risk situation in which available knowledge, though imperfect, is adequate for action and in which the cost of additional knowledge equals its value, and (5) the subjective certainty situation in which knowledge is complete enough for managers to act as if they had perfect knowledge. As the first four of these situations all involve inadequate knowledge, they can be grouped together under the label subjective uncertainty."

A cattle feeder has a number of alternatives facing him both before a feeding operation is started and while it is being carried on. Those operators who feel price dangers are too great and do not value prospective improvement in knowledge higher than its cost seek other alternatives. Some feeders vary their production plans on the basis of current knowledge, going from light to heavy cattle, from a predominant roughage system to heavy grain feeding, from many animals to a few or none, depending on expected changes in prices and costs. The latter type of action has earned some feeders the derogatory name "in and outers" when actually such actions reflect

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1/ Glen L. Johnson and C. B. Haver, Decision Making Principles in Farm Management, Kentucky Agricultural Experiment Station, Bulletin #593, p. 8.

good management in many cases, depending on their ability to observe and analyze.

The strategy that allows an operator to change his feeding enterprises in ways as described above can best be termed as "flexibility". In essence, flexibility deals with the present allocation of assets so as to be able to adjust to changing situations. Whenever information becomes available, through time, it may pay to acquire the ability to postpone decisions until more information is available. The costs of acquiring such ability to postpone involve the costs of inefficiently employed assets while the time is used in making additional information available. Flexibility is used in an optimum manner when the anticipated value of additional information is equal to the cost of acquiring such information, including the cost of flexibility.

The primary goal is to obtain more information--to continue learning--so that fewer subjective decisions have to be made and more objective decisions can be made. When more information is available, predictions can be made with a higher degree of confidence.

The real difference then, between risk and uncertainty, is that point at which the manager decides he has enough information to act, thereby turning an uncertainty into a risk.

Theoretical Basis for Cost Analysis

Size and Cost Economies

Popular concern over feedlot size has to do with per-unit costs associated with feedlots of different sizes. The individual feedlot operator is interested in the average and marginal costs as they relate to the profitability of his feedlot under various degrees of utilization.

By cost economies or cost diseconomies, I refer to phenomena which cause unit costs to decrease or increase as output is expanded. For example, suppose the long run average cost curve in Figure 1 represents the nature of some hypothetical feedlot.

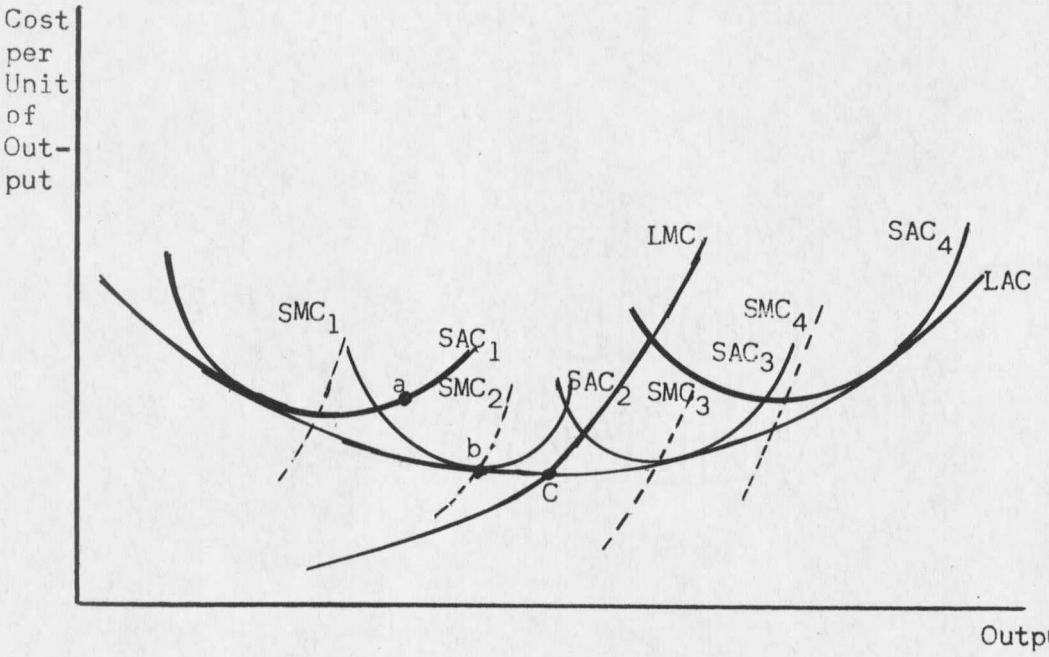


Figure 1. A Long Run Average Cost Curve for a Hypothetical Feedlot.

Here a movement from point "a" (on short run average cost curve 1), to point "b" (on short run average cost curve 2), would be an economy of scale; the feeder has acted in such a way so as to lower per-unit costs by increasing the output of the feedlot. This method of economizing could be continued all the way to the minimum point on the long run average cost curve and be legitimately referred to as an economy of scale.[1/] However, this writer

1/ The term "size" is used to describe a situation in which the level of fixed inputs has been changed, but this change is not necessarily proportional between fixed inputs. When this change is proportional between all inputs the term "scale" is used.

prefers to call it economies of size.

Heady recognizes cost economies and diseconomies in agriculture as existing within one of four classifications or areas.[1/]

The first, external economies, arise in farm costs as the number and size of farms in an area increase to such an extent that feed mills, marketing outlets, transportation facilities, and irrigation and drainage projects are built up to give lower costs of production in these service areas.

The second, referred to as external diseconomies, arise as all farms in the industry increasingly bid labor, nitrogen for fertilizer, or other resource services away from competing industries. This situation occurs as higher prices are paid for factors and per-unit production costs increase. An example may arise under pump irrigation--a point can be reached at which the use of more water by one farmer causes less to be available to others as the ground water level is lowered and pumping costs are increased.

Similarly, there exist to a farm operator internal diseconomies which arise mainly in a technical sense. This phenomenon is known as "factor interaction." When the labor supply is taken as a fixed resource, a conflict often occurs for the farm operator as to which enterprise he should devote his limited time. Farming operations often have to take precedence over cattle feeding in the spring and summer of each year.

Of all the possible forces which can give rise to cost advantages for farm feedlots, internal physical economies growing out of proportionality relationships are most important. These proportionality adjustments are

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1/ E. O. Heady, Agricultural Production and Resource Use, Prentice-Hall, 1952, pp. 360-364.

reflected largely in changes in the use and form of fixed factors rather than pure scale adjustments.

To put the concept of internal physical economies in a workable framework we may refer to the conventional theory of the firm.

In the conventional theory the structure includes a process or production technique. The output of this process is single and unspecified. The inputs are of two categories; variable inputs, and one or more fixed factors. Input and output are continuously variable.

More commonly, in actual firm operation, adjustments in the inputs of production involves discontinuity and have relatively limited substitution possibilities. The deviations from conventional theory in order to analyze feedlot operations suggest three important modifications.1/ These modifications stress discontinuous cost functions, discontinuity in rates of output, and the additional elaborations needed in the treatment of durable or fixed inputs.

Initially, in discussing discontinuous cost functions, the nature of a feedlot's fixed inputs should be mentioned. For example, consider a roller mill in a large feedlot operation. This type of machine has a large capacity and its cost is a major investment. As the machine needs one person to run it the output potential is the capacity rate of the roller-operator unit. A total cost curve for one roller-operator unit could be illustrated by curve "A" in Figure 2.2/ This one roller-operator unit is producing rolled

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1/ B. C. French, L. C. Sammet, and R. G. Bressler, "Economic Efficiency in Plant Operations with Special Reference to the Marketing of California Pears", Hilgardia, California Agricultural Experiment Station, Volume 24, July 1956, pp. 545-578.

2/ Ibid., pp. 551-553.

grain output up to OX . If rolled grain output were to be increased above the one roller-operator unit, a second roller-operator unit would come into use. A "kink" or discontinuity occurs at OX_1 where the second machine comes into use. To obtain minimum costs, the two machines are used equally or where their marginal costs are equal with the resulting minimum total cost curve (B), Figure 2. If a third machine is added (curve C), all three machines will be used at the same rate, (their marginal costs are equal), and another discontinuity will occur at OX_2. Therefore, when rolled grain output is varied by varying the use of identical machines, the variable cost function for the feedlot will be discontinuous even though continuous variation is possible for each machine. As the number of equipment units is increased, the total cost function approaches linearity.

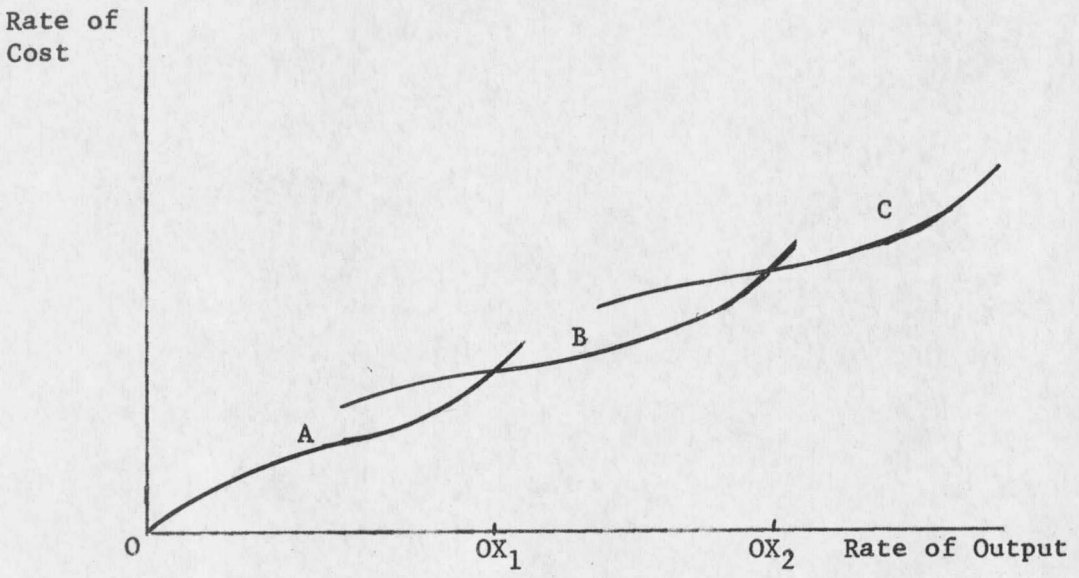


Figure 2. Successive Cost Curves Resulting from the Addition of More Machines.

This discontinuity of the total cost function is reflected with similar discontinuities in the average cost relationships as illustrated in Figure 3.

With each addition of a roller-operator unit the volume of rolled grain is increased. In a feedlot of sufficient size the larger volume causes declining average total costs as long as the decline in per-unit fixed cost is greater than the increase in per-unit variable cost. The decreasing arcs infer that the average total cost per unit of volume decreases as the number of units used increases. This reduction in average cost per unit of volume with each addition of a major input is a result of the intensification that occurs with the other variable and fixed factors of production. Most of the facilities are used most of the time.

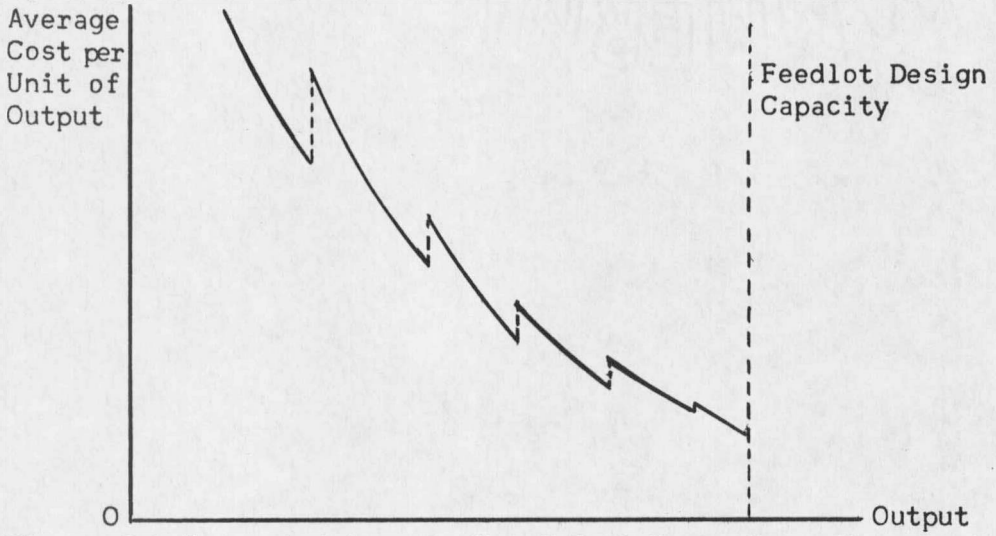


Figure 3. Segmented Average Total Cost Curve for a Hypothetical Feedlot.

Turning now to a feedlot's variable inputs, theory assumes that output can be produced by varying proportions of input. In actual feedlot operation, the variable inputs tend to be associated with some fixed factor. For example, each roller unit requires one worker, regardless of the rate at which grain flows through it. Other units of related machinery may operate at

constant rates per hour so that operating costs in addition to labor costs vary discontinuously with the use of successive units of equipment. With these fixed proportions the cost discontinuities are illustrated in Figure 4.[1] The steps occur as output is varied up to the capacity of each roller unit, and an additional machine is brought into use. The function in Figure 4 represents "economic" rather than physical inputs, i.e. man hours for which the firm must pay. Physical inputs in terms of energy and exertion may vary continuously and idleness will be noted at all but the lower corner positions on the cost curve.

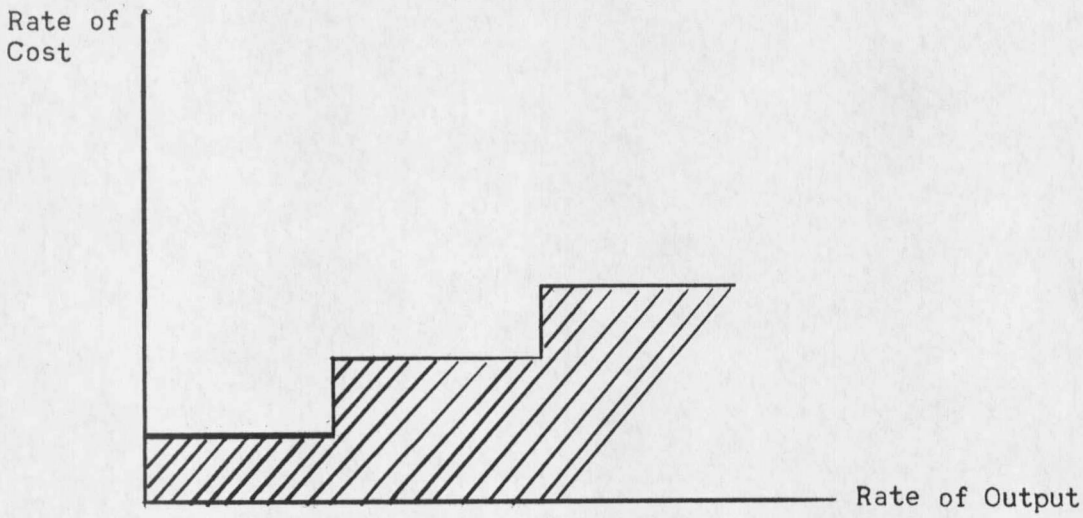


Figure 4. Segmented Cost Curve as Output is Varied up to the Capacity of a Roller Unit.

A related modification of theory recognizes semi-variable factors in addition to the fixed and variable inputs. These semi-variable factors may include short run variations in factor-inputs which are relatively independent of volume. For example, once the livestock is purchased and put into the feedlot they become a fixed input. Each animal in the lot required a

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[1] Ibid.

relatively fixed amount of feed in order to be properly fattened, even though the feed composition can be varied.

"When the cost function is discontinuous, the condition that profits are maximized where marginal cost is equal to marginal revenue may no longer apply."[1/] Figure 5 shows a discontinuous long run total cost curve and a continuous total revenue curve.

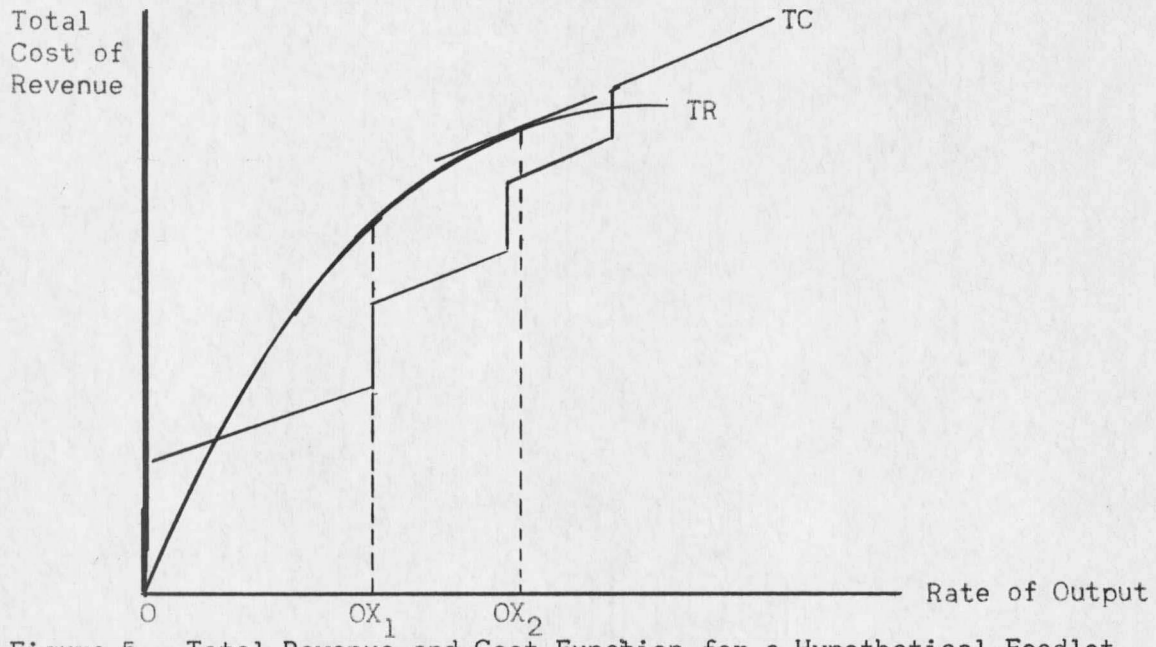


Figure 5. Total Revenue and Cost Function for a Hypothetical Feedlot.

Marginal cost equals marginal revenue at output OX_2, but examiniation of the Figure reveals that profits are actually maximized at output OX_1,--a corner position where marginal cost does not equal marginal revenue. This situation would be equally possible with discontinuous short run curves. In either case the profit maximizing position cannot be determined by simple calculus. The cost function must be examined over its entire range and the maximum profits calculated for each continuous section of the curve.

From the discussion one can realize that the major modifications from

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1/ Ibid., pp. 552-554.

the continuous function assumptions of conventional theory involve discontinuities in the rate and time dimensions.

Under normal analysis it is assumed that the firm's enterprise is free to vary time of operation with no change in cost rates. However, in actual farm feedlot operation, production is governed by how much the feedlot operation does not conflict with the farming operations. In many cases the manager wishes to discontinue feeding as planting time rolls around. When a certain time of the year occurs, the opportunity cost for farming are of such magnitude and importance that the cost structure of the manager's feedlot-farming operations has a definite break or discontinuity. For example, consider Figure 6 to be the long run opportunity cost surface for some hypothetical farmer-feeder.[1/] The cost discontinuities are represented by "kinks" in the cost surface. A consequence of the "kinks" is that to operate the feedlot for more than a time (XA) would be unprofitable.

In feedlot operation there also appear discontinuities in the rate dimension. As an example, suppose the feeder, whose opportunity cost surface is represented by Figure 6, decides to expand his feeding operation beyond the limits of farm produced feed. Upon buying additional feed, the manager encounters discontinuities in the rates of feed cost as the variation increases in the type and sources of feed. At some point the farm feeder might encounter some economies of large scale buying again resulting in discontinuities in the rate dimension as illustrated on Figure 6.

Another aspect which conventional theory fails to analyze is the

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1/ Ibid., pp. 571-572.

overhead costs of firm operation. These costs include such items as depreciation, insurance, repairs, and taxes on the firm's durable goods. On the hypothetical feedlot's cost surface, Figure 6, it is not a major problem to account for these fixed costs with the addition of a fixed base (OX).[1] This fixed base represent the long run average rate of return above variable costs that is required to maintain and replace the firm's durable goods.

Referring again to the importance of internal physical economies, it is evident that the most efficient method of exploring those economies that might exist in a firm's operation is through the cost relationships of and between firms of similar product but of different magnitudes with respect to output.

Upon study of the methods and costs of production in the California study, the economies appeared in proportionality relationships rather than pure scale relationships.[2]

It is recognized that a point may eventually be reached where the economies associated with proportionality and the spreading of fixed costs may be completely exhausted. This point is the minimum point on the long run average cost curve, such as point C in Figure 1.[3] Any output to the right of this point results in either external or internal diseconomies.

Aside from resulting in lower costs and greater profits for producers, or lower prices for consumers, or both, economies of scale might also be used to prevent a firm from going out of business. Thus, if a firm experienced a revenue fall, either internal or external economies might lower costs enough

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1/ Ibid.

2/ Bank of America, Op. Cit., p. 25.

3/ P. 14.

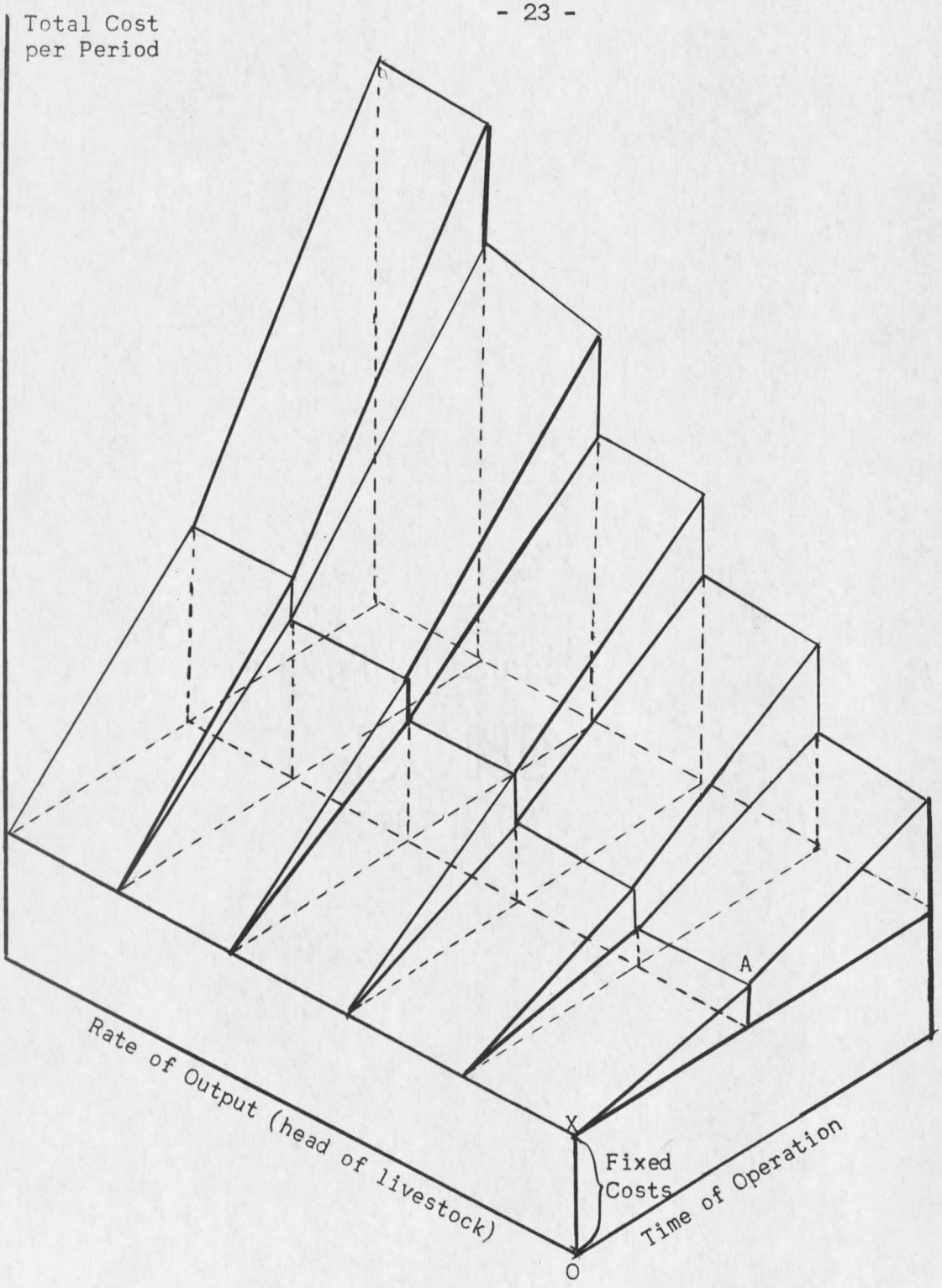


Figure 6. A Discontinuous Rate-time Opportunity Cost Surface, Including Fixed Costs for Durable Capital Goods.

to keep the firm from having to quit producing. An economy of such magnitude as to lower the average variable costs to the new price level would allow the firm to continue to operate in the short run, and if the average total cost was lowered to the new prite level the firm could operate indefinitely.

The Research Problem

The specific problem of this study is to determine the effect on feedlot income by varying facilities and degrees of utilization of typical Montana farm feedlots. This is to be accomplished through an emperical study of the costs and returns of established farm feedlots in Montana.

Objectives

The objectives of the study are: (1) To examine some of the major farm management production problems of farm feedlots in Montana, (2) to determine the effect upon farm income by varying facilities and degrees of utilization in the feedlot enterprise, and (3) to suggest areas where further research is needed and the types of data required for specific problems of optimum resource allocation.

Hypotheses

To guide the study two hypotheses are made. These are:

1. Within the present farm feeding enterprises in Montana inefficiencies exist because of non-optimum combination of resources.

2. As farm feedlots increase in size, economies can be incurred through intensification of the degree of utilization of facilities.

Methodology

The scope of this study will be limited to the economic implications of changing the operations of the feedlots under study. An optimum economic rate of combining capital and cattle will be approximated by the use of budgets.

The Budget Described

The usual budget is, essentially, a thought system which an analyst uses in deducing the outcome of operating a farm business on the assumption that the production requirements and price data he uses are correct. The budget then, represents a "synthesis" of the various parts of the feedlot enterprise, and groups the components into an organization for the purpose of observing the variations in net income which result from induced organizational changes. It is a plan whereby alternatives may be "tried out" on paper so anticipated changes may be checked one against the other in evaluating their relative profitabilities.

The principal parts of the feedlot budget are:

1. The Feedlot Plan--The number and types of livestock to be handled plus the feed to be grown and/or purchased for feeding.

2. Direct Expenses--Those expenditures which can be assignable to one of the various stages of feeding (for example, feed and operating costs).

3. The Budget Summary--A summary of expenditures and returns, and including all fixed expenses of the feedlot enterprise which are not directly attributable to a particular production phase or operation (for example, machinery repair costs and depreciation).

Having once set up a budget for the typical feedlots in the study areas,

the procedure will be to consider several alternative beef enterprises with the use of supplemental or partial budgets, and present model feedlot organizations.

When using partial budgeting techniques, the fixed costs of the feedlot operation are not considered until the budget summary.[1/] Partial budgets consider only the variable costs as these are the costs that will be affected by an enterprise change.

The income summaries made as a result of the partial budgets can be used to analyze the strong and weak points of the alternative systems as opposed to the original feedlot plan, in terms of added costs and returns.

Recognizing the fact that much variability is possible in the results of budgeting, due to price changes, it will be imperative to supplement the analysis with a summary of how the models appear under a change of prices. In this study the main prices to consider will be those of purchased and saleable cattle and feed costs.

Data Required

The budget method used in this study will compare the alternative organizations for a "going" feedlot enterprise. Certain basic data are required from which to construct the feedlot budget. This analysis implies a study of the organization by a breakdown of the whole into its component

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1/ It is both realistic and theoretically sound to consider only variable costs. In the first place, considering alternative feedlot enterprises, there can be no precise or even reasonably definite figure for certain fixed costs or equitable methods for their allocation. Second, this approach is theoretically sound because a farm manager usually considers variable costs in making immediate decisions. By definition, fixed costs are those which do not vary in a short period. Variable costs can be modified, therefore they are of primary importance.

parts. If the data required for this breakdown are unreliable or inaccurate, the budget will not be a very safe plan by which to organize the feedlot enterprise.

The gathering of the price data is concerned with putting prices on the inputs and output. The analyst may use public information as well as that from the interviews. Expected prices are often used, which becomes a subjective prediction on the part of the analyst with a probability distribution subject to the individuals psychological makeup, and by general economic conditions. This must be done with care, however, as a wrong guess of the relative prices of cattle and feed can be just as harmful as inaccurate estimates of production. The data in this study are in terms of modals based on the information obtained in the interviews.

Sources of Data

The primary data for this study were assembled in a cost and returns survey of existing Montana farm feedlots. The schedule used to collect the data desired made record of the farm size and enterprise organization, the various inputs in all phases of feedlot operation and maintenance, the time periods of feeding different classes of livestock, rates of gain, and various feeding programs.

The universe for this study is defined as being all farms with feedlots in Hill, Teton, Pondera, Cascade, Stillwater, Yellowstone, Big Horn, Richland and Dawson counties, with the limitation that these farms fattened cattle during the 1960-61 feeding season.

In all, there were approximately 600 feedlots with cattle on feed January 1, 1961.[1] Of these 600 feedlots, approximately seventy percent were in the above counties. The county agent of each county was contacted in order to establish the location of feedlot operators who might be interviewed for the needed information.

A total of fifty-five feedlot operators were interviewed in the following size groups:

	Number of Head Capacity[2]	Number of Interviews
Group I	0 - 99	11
Group II	100 - 199	18
Group III	200 - 399	16
Group IV	400 - 599	10
		55

This number (55) was believed to be as large as that needed to obtain a sample typical of the universe.

To examine the first hypothesis, models of typical feedlots existing in the areas surveyed are presented. To study the second hypothesis, alternative budgets for each feedlot are presented in the Appendices.

The final part of this study will be a summary of what was found in the study relative to the problem situation and inferences that might be applicable to the future of beef feeding in Montana.

Analysis of Primary Data

Cost and Production Data

Prior to actual data tabulation, some editing was done to eliminate

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1/ See Table I in Appendix C.

2/ Capacity is in terms of 150 to 200 square feet of feedlot space per mature beef animal.

extremes within the data. This procedure resulted in averages that have a modal characteristic.

Initially, the analysis of each size feedlot concerned itself with physical characteristics such as age, capacity, sources of cattle and feed. A livestock inventory followed, showing the annual turnover of cattle, and markets, whether they sold at auction, direct sale or terminal.

This introductory information was followed by the core of the analysis which included the schedule of operations, feed amounts and their costs, and the operating expenses.

The schedule of operations related the dates at which cattle were put into the lot, their type, weights and prices. Similarly included were the dates at which cattle were sold and their pertinent weights, prices and selling costs. These selling costs were predominately in the form of commissions paid for the "action of the auction." This information then yielded the basic input information with regard to cattle.

Following the schedule of operations, the rations fed were listed together with the total amounts of feedstuffs fed. All of the feedlot operators were asked what the farm produced feed would have sold for if not fed. Their answers represented the "in town" price of farm produced feed. To arrive at an "on farm" price which could be used to price the farm-produced feed into the feedlot operation, the following assumptions were made:

(1) The typical farm-to-town haul is ten miles.

(2) The contract price for hauling grain the ten miles to town is $2.00 per ton or 10¢ per hundredweight. Therefore, this transportation cost of $2.00 per ton will be subtracted from the "in town" price for all

farm-produced grain.

(3) All purchased feed prices will remain unchanged as the prices quoted are prices for the feed delivered to the farm.

(4) Roughage hauling prices for the same distance are $1.00 per ton; therefore, $1.00 per ton transportation costs will be subtracted from the "in town" price to calculate "on farm" roughage prices.

It was found that in most cases the principal source of labor was the feedlot's owner-operator. The majority of these operators felt that there was little or no opportunity cost for the winter labor which they used in feeding. With this in mind, no operator labor costs were included in the feedlot organizations, with the exception of one size lot which used a small amount of hired labor. The labor cost in this case was $1.50 per hour.

The operating costs were taken from the tabulated interview data in terms of averages. The only costs that were fairly standard for all lots were the grain rolling charges, which varied between $3.75 and $4.00 per ton.

The charge for death loss was figured in the original purchase cost of livestock plus one month's feed cost, as most animals are lost early in the feeding period. Death loss was approximately one percent of the animals put in the lot.

The tax costs on the corrals and land on which the feedlots stood were not obtainable as the feedlot operators had only a total non-itemized tax bill. However, it was expressed that this cost was nominal and could be ignored. Tax costs on cattle in the lot were more readily obtainable and were found to vary between one to two dollars per head of cattle in the lot on March 1st, when the tax assessment was made.

The interest charges were calculated on the investment in cattle, feed, and the present value of the equipment. Interest rates varied between six and seven percent, but for purposes of consistency and what existed typically, a six percent interest charge was used for all feedlot organizations.

Analysis of Secondary Data

Production and input data were compared to recognized standards in order to determine their adequacy.[1/] It was found that rates of gain obtained and feed levels practiced were compatible to the standards.

Some costs, such as original and replacement costs of equipment, were not obtained with the interviews. The procedure used to arrive at these costs was to establish a replacement cost of the "typical" equipment used in feedlot operation and then adjust these replacement costs by price indexes, according to their various ages to find original cost.[2/] The investment cost of corrals were handled in a manner similar to the equipment.

The depreciation charges for all the equipment were based on the straight line method of depreciation. However, for interest charges, the constant percentage method of depreciation was used to establish present value. This method was used because a larger percentage of the facility cost is charged off early in its expected life. This method is used

1/ F. B. Morrison, Feeds and Feeding, 22nd Edition, Morrison Publishing Co., 1956, and National Research Council, Recommended Nutrient Allowances for Beef Cattle, Dec., 1950.

2/ M. C. Taylor, P. J. Creer, R. D. Rawson, Prices Received and Prices Paid by Montana Farmers and Ranchers, 1949-1958, Montana Agricultural Experiment Station and the United States Department of Agriculture, Bulletin #554, Bozeman, Oct., 1960, p. 20.

extensively by businessmen for tax purposes and to ease the costs of possible premature obsolescence.

Alternative Feedlot Organizations

While there exist many possible reorganizations of an existing feeding enterprise, there are relatively few which are applicable to existing Montana farm feedlots. The main reason is that the majority of farmers, especially with the smaller lots (below 200 head capacity), didn't want feeding to interfere with their farming operations.

It was found that all feedlot size groups studied (0-100, 100-200, 200-400, and 400-600 head capacities) were operating below their respective capacities. The ratio of cattle fed to feedlot capacity was .50, .68, .75, and .86 for the size groups one through four respectively. This situation is partly attributable to the fact that feeders have been operating on a rather narrow margin for the past two to three years due to comparatively low fed-cattle prices, and because of the lack of knowledge concerning what economies could occur in spreading fixed costs over more units of output.

With the above in mind, it is evident that one of the main alternatives of Montana feedlot operation is that of filling the lot to capacity. In light of the capital limitations that most farm operators face, the alternatives in capital investments for feeding are also rather limited. During the course of the interviews it was frequently stated by the operators that a small grain dry roller and possibly a power feeding box would be of importance in terms of time and money saving equipment. These two pieces of equipment are considered in this study.

The divided opinion was expressed by feeders that either yearlings or calves were most profitable. This possibility is explored in the alternatives, in that each lot is filled with calves and then yearlings for comparison.

Some feeders were also feeding cows and others were "warming up" 1/ calves. Both of these alternatives were seemingly profitable, however, they were not investigated in this study because the cases were too isolated from which to draw conslusive data.

1/ "Warming up" is one type of beef production where feeder cattle are either summered or wintered on hay and/or pasture to be sold as heavy feeder cattle for further fattening.

CHAPTER II

PRESENT FEEDLOT ORGANIZATIONS IN THE SURVEY AREA

Feedlot Size I

This first size feeding enterprise was typical of the dryland farming areas of Montana. The labor supply on the farm usually consisted of the owner-operator, some family labor, and seasonal labor hired during the cropping season.

The yard has a capacity of ninety head and has been in operation eight years. Grain is fed through a self-feeder and roughage is fed through bunks. The farm operator raises eightypercent of his feed and all of the cattle put in the lot.

In general, in all feedlot size groups, manure was loaded on a truck with a tractor equipped with a hydraulic loader and taken to the fields for spreading. No value was placed on the manure in this study because feeders in most instances didn't have an idea as to what it was worth. The value of farm manure to long run farming operations could be the subject of another thesis

Equipment for the Feedlot

For the equipment that had to be purchased for feeding, the full depreciation, repair, and interest charges will be recognized. Overhead costs of equipment used in feeding, but existing before feeding began are not charged to the feedlot, since those costs are already being borne by the other farm enterprises. Those additional repair, maintenance and fuel costs as a result of operating the feedlot are recognized in the operating expenses. In most cases the water system was already established before feeding began so

so its establishment costs are not charged to the feedlot.

TABLE II. EQUIPMENT FOR FEEDLOT SIZE I.[a]

Item	Age	Orig. Cost	Life	Salvage Value %	Salvage Value $	Present Value	Deprec. Charge	1960 Replac. Cost	% Use to Lot	Investment to the Feedlot [b]
						Dollars	Dollars	Dollars		Dollars
Corrals	8	746	15	--	--	196	50	800	100	196[c]
Squeeze	8	268	20	--	--	97	13	325	45	44
Totals							63			240

a/ Other equipment used in feeding but present on the farm before feeding began include: ½ ton pickup, 1½ ton truck, 3-plow tractor with a hydraulic loader, 25 ft. auger, 4,500 bu. of grain bin space.

b/ This is the Percent Use to Lot times Present Value.

c/ For the corral computations see Table III, Appendix C.

Cattle

A fifty cow herd produces forty-six calves per year for the feedlot. The feeding period for these calves is approximately 210 days. Death loss is approximately one percent and in this case we will assume the loss of one calf.

TABLE III. TOTAL CATTLE COST AND RECEIPTS FOR FEEDLOT SIZE I.

	Date	No.	Kind	Weight	Price Per Cwt.	Price Per Head	Total Price
				Pounds	Dollars	Dollars	Dollars
Cattle Cost	Oct. 30	46	Calves	425	25.00	106.25	4,888.00
Cattle Receipts	May 1	45	Calves	870	22.20	193.14	8,691.00

Rations and Feeding Program

The rations consisted of steam rolled barley, molasses, alfalfa hay, barley straw, a protein supplement and salt. It took 20 to 30 days to get the cattle on full feed and once that level had been attained the cattle received about one pound of protein supplement per head per day. The cattle were in the lot about 210 days with a daily gain of 2.12 pounds. Generally, in all lots, when starting on feed, the calves were fed one-half pound of grain the first day and increased one-half pound each day till on full feed.

TABLE IV. TOTAL AMOUNTS AND COSTS OF FEED CONSUMED IN FEEDLOT SIZE I.

Item	Amount Per Head	Total Amount	Price in Town	Price on Farm	Total Cost
	Pounds	Tons	Dollars	Dollars	Dollars
Barley	2,488	56	30.50	28.50	1,596.00
Molasses	177	4	60.00	60.00	240.00
Alfalfa	888	20	20.50	20.50	410.00
Straw	222	5	12.00	11.00	55.00
Protein Supplement	177	4	85.00	85.00	340.00
Bedding Straw	445	10	12.00	11.00	110.00
Salt	13	.3	40.00	40.00	12.00
Total Feed Cost					2,763.00
Feed Cost per Head Sold					61.40

Operating Costs for the Feedlot

No hired labor was needed to handle the feedlot operation. No labor charge was made as the operator didn't recognize any other outlets for his winter time.

TABLE V. OPERATING COSTS FOR FEEDLOT SIZE I.

Item	Amount
Death loss (feed cost: 1 head, 1 month)	$ 9.00
Spray	15.00
Machinery repair and maintenance	70.00
Gas and oil	77.00
Corral repair	18.00
Electricity	48.00
Telephone	5.00
Rolling	210.00
Veterinary and medicine	54.00
Taxes	45.00
Cattle transportation	21.00
Total Operating Cost	$572.00

Interest Charges

Interest charges are six percent of the investment in feed, cattle and equipment purchased for feeding. Interest is charged only for the months that the cattle are in the lot.

TABLE VI. INTEREST EXPENSE FOR FEEDLOT SIZE I.[a/]

Total cattle investment	$4,888.00
Total feed investment	2,763.00
Total	7,651.00
$\frac{\$7,651.00 \times .06}{12} \times 7$ months	$268.00
Equipment--$240.00 x .06	14.00
Total Interest Charges	$282.00

a/ As feedlots in Montana were built on many different types of land, a representative land value wasn't available; therefore, interest charges on land for the feedlots have been omitted.

Summary

Table VII is a financial summary of the above costs for feedlot size I, the purpose being to show the net income figures. Total cost per pound of gain was computed by dividing the total pounds of beef produced into the total expenses, excluding the costs of the cattle. Feed cost per pound of gain was found in a similar manner, dividing the feed cost by the pounds of beef produced.

TABLE VII. FINANCIAL SUMMARY OF FEEDLOT SIZE I. (Present Organization)

Total Receipts			$8,691.00
Cattle expenses		$4,888.00	
Other expenses:			
Feed	$2,763.00		
Operating	572.00		
Depreciation	63.00		
Interest	282.00		
Total Other Expenses		3,680.00	
Total Expenses			8,568.00
Net Income to Labor and Management			$ 123.00
Net Income per Head Sold			$ 2.73
Pounds of Beef Produced		20,025	
Total Cost per Pound Gain			18.37¢
Feed Cost per Pound Gain			13.79¢
Non-feed Cost per Pound Gain			4.58¢

Feedlot Size II

The majority of feedlots of this size, as with the larger lots in Montana, are found in the irrigated valleys with the consequent addition of corn silage in the ration. The labor supply on the farm usually consists of the owner-operator, some family labor and seasonal labor hired during the

growing season. The typical lot is eleven years old with a capacity of 175 head, which are bunk fed. The lot operator usually raises sixty percent of his feed and purchases all of his cattle.

Equipment for the Feedlot

For the equipment that had to be purchased for feeding the full depreciation, repair and interest charges are shown. Overhead costs of equipment used in feeding, but existing before feeding began are not charged to the feedlot, since those costs are already being borne by the other farm enterprises. Those additional repair, maintenance, and fuel costs as a result of operating the feedlot are recognized in the operating expenses.

TABLE VIII. EQUIPMENT FOR FEEDLOT SIZE II.[a/]

Item	Age	Orig. Cost	Life	Salvage Value %	Salvage Value $	Present Value	Deprec. Charge	1960 Replac. Cost	% Use to Lot	Investment to the Feedlot[b/]
						Dollars	Dollars	Dollars		Dollars
Corrals, etc.	11	880	15	--	--	163	59	1127	100	163[c/]
Hydl. loader	10	948	15	10	95	195	63	1300	10	19
Squeeze	5	274	20	--	--	152	14	325	100	152
Pit silo-600T (25x75x12)	8	238	25	--	--	102	10	255	100	102
Corn chopper	7	1756	15	15	175	597	158	2100	100	597
Totals							304			1033

a/ Other equipment used in feeding but present on the farm before feeding began include: ½ ton pickup, 1½ ton truck, 3-plow tractor, 31 ft. auger, 10,400 bu. grain storage.

b/ This is the Percent Use to Lot times the Present Value.

c/ For the corral computations see Table III, Appendix C.

Cattle

The cattle for Feedlot Size II are all purchased by the feeder in the fall, usually upon completion of harvesting. A combination of calves and yearlings are usually fed. Calves are on feed about 230 days and yearlings about 170 days. We will assume the death loss of one calf.

TABLE IX. TOTAL CATTLE COSTS AND RECEIPTS FOR FEEDLOT SIZE II.

Item	Date	No.	Kind	Weight	Price Per Cwt.	Price Per Head	Total Price
				Pounds	Dollars	Dollars	Dollars
Cattle Cost	Nov. 1	55	Calves	400	24.80	99.20	5,456.00
	Nov. 1	65	Yearlings	660	21.00	138.60	9,009.00
Total Cattle Cost							14,465.00
Cattle Receipts	June 18	54	Calves	837	22.90	191.66	10,350.00
	Apr. 19	65	Yearlings	1095	22.00	240.90	15,658.00
Total Cattle Receipts							26,008.00

Rations and Feeding Program

The ration consisted of steam rolled barley, molasses, alfalfa hay, corn silage, a protein supplement and salt.

It took about two weeks for yearlings and three to four weeks for calves to be put on full feed. After full feed had been attained, each animal was receiving about one pound of protein supplement per head per day.

The calves were in the lot about 230 days and had a daily gain of 1.9 pounds. The yearlings were in the lot about 170 days and had a daily gain of 2.63 pounds. It was found that the yearlings consumed approximately the same amount of feed as did the calves in about 50 less days.

TABLE X. TOTAL AMOUNTS AND COSTS OF FEED CONSUMED IN FEEDLOT SIZE II.

Item	Amount Per Head Pounds	Total Amount Tons	Price in Town Dollars	Price on Farm Dollars	Total Cost Dollars
Produced Barley	2,350	100	31.60	29.60	2,960.00
Purchased Barley		40	31.60	31.60	1,264.00
Molasses	101	6	60.00	60.00	360.00
Alfalfa	706	45	22.00	21.00	945.00
Corn Silage	3,090	184	7.00	6.00	1,104.00
Protein Supplement	168	10	88.00	88.00	880.00
Bedding Straw	420	25	12.00	11.00	275.00
Salt	13	3/4	40.00	40.00	30.00
Total Feed Cost					7,818.00
Feed Cost per Head Sold					65.70

Operating Costs for Feedlot Size II

No extra labor was needed to handle the feedlot operation. No labor charge was made as the operator didn't recognize any other outlets for his winter time.

TABLE XI. OPERATING COSTS FOR FEEDLOT SIZE II.

Item	Amount
Spray	$ 28.00
Machinery repair and maintenance	200.00
Gas and oil	220.00
Corral repair	57.00
Electricity	52.00
Telephone	16.00
Rolling	560.00
Veterinary and medicine	90.00
Marketing	289.00
Transportation	132.00
Taxes	125.00
Death loss	10.00
Total Operating Cost	$1,779.00

Interest Charges for Feedlot Size II

Interest charges are six percent of the investment in feed, cattle, and equipment purchased for feeding. Interest is charged only for the months that the cattle are in the lot.

TABLE XII. INTEREST CHARGES FOR FEEDLOT SIZE II.

Total Cattle investment	$14,465.00
Total Feed investment	7,818.00
Total	22,283.00
$\frac{\$22,283.00 \times .06}{12} \times 6$ months	$666.00
Equipment--$1,033.00 x .06	62.00
Total Interest Charges	$728.00

Summary

Table XIII is a financial summary of the above costs for feedlot size II, the purpose being the net income figures. Total cost per pound of gain was computed by dividing the total pounds of beef produced into the total expenses, excluding the costs of the cattle. Feed cost per pound of gain was found in a similar manner, dividing the feed cost by the pounds of beef produced.

TABLE XIII. FINANCIAL SUMMARY OF FEEDLOT SIZE II. (Present Organization)

Total Receipts			$26,008.00
Cattle expenses		$14,465.00	
Other expenses:			
Feed	$7,818.00		
Operating	1,779.00		
Depreciation	304.00		
Interest	728.00		

TABLE XIII. FINANCIAL SUMMARY OF FEEDLOT SIZE II. (Continued)

Total Other Expenses	10,629.00	
Total Expenses		25,094.00
Net Income to Labor and Management		$ 914.00
Net Income per Head Sold		7.68
Pounds of Beef Produced	51,878	
Total Cost per Pound Gain		20.49¢
Feed Cost per Pound Gain		15.07¢
Non-feed Cost per Pound Gain		5.42¢

Feedlot Size III

This size feedlot was predominantly found in the irrigated valleys of Montana, with corn silage a principal part of the ration. This feedlot, with an average capacity of 320 head, had been in operation eleven years and fed 240 head during the 1960-61 feeding season. The labor for the feedlot is supplied mainly by the owner-operator plus a small amount of hired labor. The operator raises fifty percent of his feed and purchases all of his cattle.

Equipment for the Feedlot

For the equipment that had to be purchased for feeding, the full depreciation, repair and interest charges are shown. Overhead costs of the equipment used in feeding, but existing before feeding began are not charged to the feedlot since these costs are already borne by the other farm enterprises. Only those additional repair, maintenance and fuel costs as a result of operating the feedlot are shown in the operating expenses.

TABLE XIV. EQUIPMENT FOR FEEDLOT SIZE III.[a]

Item	Age	Orig. Cost	Life	Salvage Value %	Salvage Value $	Present Value	Deprec. Charge	1960 Replac. Cost	% Use to Lot	Invest. to the Feedlot[b]
						Dollars	Dollars	Dollars		Dollars
Corrals, etc.	11	1650	15	--	---	275	110	2134	100	275[c]
2 T. truck	7	3045	15	10	304	1041	200	3619	25	260
Hydraul. loader	9	1030	15	10	103	259	67	1300	50	130
Squeeze	6	270	20	--	---	122	13	325	100	122
Pit silo-720 T. (25x90x12)	8	280	25	--	---	120	11	300	100	120
Silage chopper	7	1756	15	10	175	597	158	2100	100	597
Totals							559			1504

a/ Other equipment used in feeding but present on the farm before feeding began include: ½ ton pickup, 1½ ton truck, 31 ft. auger, 3-plow tractor, livestock sprayer, 13,000 bu. grain storage.

b/ This is the Percent Use to Lot times Present Value.

c/ For the corral computations see Table III, Appendix C.

Cattle

The cattle for Feedlot Size III are all purchased by the feeder in the fall, usually upon completion of the crop harvest. A combination of calves and yearlings are usually fed; the calves about 220 days and the yearlings about 170 days. A death loss of three calves in this lot is assumed.

TABLE XV. TOTAL CATTLE COSTS AND RECEIPTS FOR FEEDLOT SIZE III.

Item	Date	No.	Kind	Weight	Price Per Cwt.	Price Per Head	Total Price
				Pounds	Dollars	Dollars	Dollars
Cattle Cost	Nov. 10	90	Calves	415	23.00	96.28	8,665.00
	Nov. 10	150	Yearlings	650	21.80	141.70	21,255.00
Total Cattle Cost							29,920.00

TABLE XV. TOTAL CATTLE COSTS AND RECEIPTS FOR FEEDLOT SIZE III. (Cont.)

Item	Date	No.	Kind	Weight	Price Per Cwt.	Price Per Head	Total Price
				Pounds	Dollars	Dollars	Dollars
Cattle							
Receipts	Apr. 30	150	Yearlings	1080	21.30	230.04	34,506.00
	June 18	87	Calves	910	21.50	195.65	17,022.00
Total Cattle Receipts							51,528.00

Rations and Feeding Program

The ration consisted of steam rolled barley, alfalfa hay, corn silage, protein supplement and salt.

It took about two weeks for yearlings and three to four weeks for calves to be put on full feed. Once full feed had been attained, each animal was receiving about one pound of protein supplement per head per day.

The calves were in the lot about 220 days and had a daily gain of 2.25 pounds. The yearlings were in the lot about 170 days and had a daily gain of 2.52 pounds.

TABLE XVI. TOTAL AMOUNTS AND COSTS OF FEED CONSUMED IN FEEDLOT SIZE III.

Item	Amount Per Head	Total Amount	Price in Town	Price on Farm	Total Cost
	Pounds	Tons	Dollars	Dollars	Dollars
Produced Barley	2,396	100	32.00	30.00	3,000.00
Purchased Barley		184	32.00	32.00	5,888.00
Alfalfa	902	107	23.00	22.00	2,354.00
Corn Silage	3,375	400	7.00	6.00	2,400.00
Protein Supplement	143	17	86.00	86.00	1,462.00
Bedding Straw	400	50	11.00	10.00	500.00
Salt	16	2	60.00	60.00	120.00
Total Feed Cost					15,724.00
Feed Cost per Head Sold					66.35

Operating Costs for the Feedlot

Some hired labor was used in this size feedlot. No labor charge was put on the operator's labor as he didn't recognize any other outlets for his winter time.

TABLE XVII. OPERATING COSTS FOR FEEDLOT SIZE III.[a/]

Items	Amount
Spray	$ 70.00
Machinery repair and maintenance	205.00
Gas and oil	350.00
Corral repair	145.00
Electricity	110.00
Telephone	60.00
Rolling	1,136.00
Veterinary and medicine	330.00
Marketing	664.00
Death	30.00
Transportation	275.00
Insurance	42.00
Taxes	250.00
Labor (220 hrs. x 1.50/hr.)	330.00
Total Operating Cost	$3,997.00

a/ The operator's labor amounted to two hours a day for 300 days and the hired labor worked one hour a day for 220 days.

Interest Charges for Feedlot Size III

Interest charges are six percent of the investment in feed, cattle, and the equipment purchased for feeding. Interest is only for the months the cattle are in the lot.

TABLE XVIII. INTEREST CHARGES FOR FEEDLOT SIZE III.

Total cattle investment	$29,920.00
Total feed investment	15,724.00
Total	$45,644.00
$\frac{\$45,644.00 \times .06}{12} \times 8$ months	$ 1,826.00
Equipment--$1,504.00 x .06	90.00
	$ 1,916.00

Summary

Table XIX is a financial summary of the above costs for feedlot size III, the purpose being the net income figures. Total cost per pound of gain was computed by dividing the total pounds of beef produced into the total expenses, excluding the costs of the cattle. Feed cost per pound of gain was found in a similar manner, dividing the feed cost by the pounds of beef produced.

TABLE XIX. FINANCIAL SUMMARY OF FEEDLOT SIZE III. (Present Organization)

Total Receipts			$41,528.00
Cattle Expenses		$29,920.00	
Other Expenses:			
Feed	$15,724.00		
Operating	3,997.00		
Depreciation	559.00		
Interest	1,916.00		
Total Other Expenses		22,196.00	
Total Expenses			$52,166.00
Net Loss to Labor and Management			588.00
Net Loss per Head Sold			2.48
Pounds of Beef Produced		107,565	
Total Cost per Pound Gain			20.63¢
Feed Cost per Pound Gain			14.62¢
Non-feed Cost per Pound Gain			6.01¢

Feedlot Size IV

This feedlot, with a capacity of 520 head, has been operating eleven years and fed 450 head of calves and yearlings during the 1960-61 feeding season.

This lot is equipped with a dry roller or grinder for grain preparation, and a power box for feeding and manure spreading. The grain milling facilities are used about 1½ hours per day, rolling about 2½ tons of grain during that period. The owner-operator supplies 100 percent of the labor, produces about 30 percent of the feed and purchases all of his cattle.

Equipment for the Feedlot

The equipment that had to be purchased for feeding, the full depreciation, repair, and interest charges will be shown. Overhead costs of the equipment used in feeding, but existing before feeding began are not charged to the feedlot since these costs are already borne by the other farm enterprises. Those additional repair, maintenance and fuel costs as a result of operating the feedlot are shown in the operating expenses.

TABLE XX. EQUIPMENT FOR FEEDLOT SIZE IV.[a]

Item	Age	Orig. Cost	Life	Salvage Value %	Salvage Value $	Present Value	Deprec. Charge	1960 Replac. Cost	% Use to Lot	Invest. to the Feedlot[b]
						Dollars	Dollars	Dollars		Dollars
Corrals, etc	11	2043	15	--	---	399	160	3073	100	399[c]
2 T. truck	10	2746	15	10	274	593	165	3620	40	237
Power box	4	810	15	10	81	438	73	1000	100	438
Hydraul. loader	8	1071	15	10	107	313	64	1300	45	141
Squeeze	6	270	20	--	---	122	13	325	100	122
Silage chopper	7	1756	15	10	175	597	158	2100	100	597

TABLE XX. EQUIPMENT FOR FEEDLOT SIZE IV. (Continued)

Item	Age	Orig. Cost	Life	Salvage Value %	Salvage Value $	Present Value	Deprec. Charge	1960 Replac. Cost	% Use to Lot	Invest. to the Feedlot[b]
						Dollars	Dollars	Dollars		Dollars
Pit silo-1700T (25x220x12)	6	675	25	--	---	350	27	720	100	350
Bearcat roller	5	1770	15	10	177	821	106	2100	100	821
Auger-36'	5	340	15	--	---	142	23	403	100	142
Totals							789			3247

a/ Other equipment used in feeding but present on the farm before feeding began include: ½ ton pickup, 1½ ton truck, livestock sprayer, 3-plow tractor, 18,000 bu. grain storage.

b/ This is the Percent Use to Lot times Present Value.

c/ For the corral computations see Table III, Appendix C.

Cattle

The cattle for feedlot size IV are all purchased by the feeder in the fall, usually after completion of the crop harvest. A combination of calves and yearlings are usually fed; the calves about 250 days and the yearlings about 180 days. Assume a death loss of four calves and one yearling.

TABLE XXI. TOTAL CATTLE COSTS AND RECEIPTS FOR FEEDLOT SIZE IV.

Item	Date	No.	Kind	Weight	Price Per Cwt.	Price Per Head	Total Price
				Pounds	Dollars	Dollars	Dollars
Cattle Cost	Sept. 30	150	Calves	380	23.20	88.16	13,224.00
	Oct. 17	300	Yearlings	605	21.80	131.89	39,567.00
Total Cattle Cost							52,791.00
Cattle Receipts	Apr. 15	299	Yearlings	1045	22.40	234.08	69,989.00
	June 6	146	Calves	900	24.12	217.00	31,682.00
Total Cattle Receipts							101,671.00

Rations and Feeding Program

The ration consisted of dry rolled barley, alfalfa hay, corn silage, protein supplement and salt.

It took about two weeks for the yearlings and three to four weeks for the calves to be put on full feed. Once full feed had been attained each animal was receiving about one pound of protein supplement per head per day.

The calves had a daily gain of about 2.08 pounds and the yearlings about 2.44 pounds.

TABLE XXII. TOTAL AMOUNTS AND COSTS OF FEED CONSUMED IN FEEDLOT SIZE IV.

Item	Amount Per Head	Total Amount	Price in Town	Price on Farm	Total Cost
	Pounds	Tons	Dollars	Dollars	Dollars
Produced Barley	2090	125	33.50	31.50	3,937.00
Purchased Barley		340	33.50	33.50	11,390.00
Alfalfa	1190	165	23.00	22.00	3,630.00
Purchased Alfalfa		100	23.00	23.00	2,300.00
Corn Silage	4000	900	6.80	6.00	5,400.00
Protein Supplement	180	44	85.00	85.00	3,740.00
Bedding Straw	280	60	12.00	11.00	660.00
Salt	16	4	40.00	40.00	160.00
Total Feed Cost					$31,217.00
Feed Cost per Head Sold					70.15

Operating Costs for the Feedlot

No hired labor is needed for this size lot as it is somewhat more mechanized than the smaller lots. No labor charge was put on the operator's labor as he didn't recognize any other outlets for his winter time.

TABLE XXIII. OPERATING COSTS FOR FEEDLOT SIZE IV.

Item	Amount
Spray	75.00
Machinery repair and maintenance	345.00
Gas and oil	435.00
Corral repair	140.00
Electricity	140.00
Telephone	55.00
Veterinary and medicine	400.00
Marketing	1,201.00
Death (Feed cost)	50.00
Transportation (Cattle)	360.00
Insurance	95.00
Taxes	570.00
Total Operating Cost	$3,866.00

Interest Charges

Interest charges are six percent of the investment in feed, cattle, and the equipment purchased for feeding. Interest is only for the months the cattle are in the lot.

TABLE XXIV. INTEREST CHARGES FOR FEEDLOT SIZE IV.

Total cattle investment	$52,791.00
Total feed investment	31,217.00
Total	$84,008.00
$\frac{\$84,008.00 \times .06}{12}$ x 10 months	4,200.00
Equipment--$3,247.00 x .06	195.00
Total Interest Charges	$4,395.00

Summary

Table XXV is a financial summary of the above for feedlot size IV, the

purpose being to show the net income figures. Total cost per pound of gain was computed by dividing the total pounds of beef produced into the total expenses excluding the costs of the cattle. Feed cost per pound gain was found in a similar manner, dividing the feed cost by the pounds of beef produced.

TABLE XXV. FINANCIAL SUMMARY OF FEEDLOT SIZE IV. (Present Organization)

Total Receipts			$101,671.00
Cattle Expenses		$52,791.00	
Other Expenses			
Feed	$31,217.00		
Operating	3,866.00		
Depreciation	789.00		
Interest	4,395.00		
Total Other Expenses		40,267.00	
Total Expenses			93,058.00
Net Income to Labor and Management			8,613.00
Net Income per Head Sold			19.36
Pounds of Beef Produced		207,480	
Total Cost per Pound Gain			19.40¢
Feed Cost per Pound Gain			15.04¢
Non-feed Cost per Pound Gain			4.36¢

Summary of Present Feedlot Organizations

The principal income and cost figures for the four present feedlot organizations in the survey area are summarized in Table XXVI.

The differences in returns and costs between the different size feedlots are in part explained by: (1) Differences in cattle prices, (2) differences in feed prices, (3) unused feedlot capacity, and (4) the mechanization of lot size IV. Each of these factors will be considered in turn.

TABLE XXVI. INCOME AND COSTS PER POUND OF GAIN FOR THE PRESENT FEEDLOT ORGANIZATIONS.

	Feedlot Size			
	I	II	III	IV
Net Income per Head	$2.73	$7.68	-$2.48	$19.36
Total Cost per Pound Gain	18.37¢	20.49¢	20.63¢	19.40¢
Feed Cost per Pound Gain	13.79¢	15.07¢	14.62¢	15.04¢
Non-feed Cost per Pound Gain	4.58¢	5.42¢	6.01¢	4.36¢
Feeding Ratio a/	.50	.63	.75	.86

a/ Ratio of head fed to capacity.

With regard to cattle prices, lot sizes I, II, and III generally had a one to two dollar per hundredweight negative spread between cattle costs and receipts for both calves and yearlings. This partially explains the low income per head figures for these three feedlots, especially lot size III. In contrast, the averages turned out about a one dollar positive spread for both calves and yearlings for lot size IV, which partially explains the favorable income per head as compared to the smaller lot sizes.

Turning now to feed prices, it was found that as lot size increased, the proportion of purchased feed to total feed fed increased. Purchased feed in all cases studied was more expensive than farm produced feed because of the variance in types and sources of the feed. For example, the "on farm" price of farm produced barley in lot size I was $28.50 per ton, while the "in town" price of purchased barley for lot size IV was $33.50 per ton. This difference in feed cost accounts for the increase in feed cost per pound of gain as lot size increased.

In consideration of the feeding ratio we notice that each size feedlot studied did not fill their lot to capacity during the 1960-61 feeding season,

thus not spreading the non-feed costs over the largest possible number of cattle. Even though the investment costs for feedlot size I are nominal compared to the other lot sizes, the non-feed costs per pound of gain are not much less than the other lot sizes because this lot is feeding only at one-half of capacity.1/ The non-feed costs are higher for lot sizes II and III primarily because of the increased investment in specialized facilities, particularly the equipment necessary for corn silage, and they also are not feeding at capacity. In contrast, the non-feed cost per pound gain is low for lot size IV because this lot is relatively more mechanized than the other lots, and fed almost to capacity, thus spreading non-feed costs more effectively than the other lot sizes.

1/ Investment in feedlot facilities are found in Table III, Appendix C.

MODEL FEEDLOT ORGANIZATIONS

The Need for Uniform Prices

Of the economies that might appear in cattle feeding there are those associated with large scale purchasing of cattle and feed. During the course of the interviews it was found that, due to the nature of feeding, as a supplemental enterprise to farming in Montana, these economies would be difficult to establish. The majority of feeders interviewed stated that, as a rule, they purchased feed and cattle when they decided it was time to start feeding. The exceptions were those who had extra storage capacity at harvest time and did purchase feed supplies before feeding started. Those with extra storage capacity for other than farm produced grain were too few from which to draw conclusive data concerning economies of large-scale feed purchasing.

Feed prices found in the typical or existing feedlots varied between lot sizes, as did cattle prices. Since the interviews did not attempt to establish feed and cattle costs that might be characteristic of a given geographic area of Montana, or a given size feedlot, it is felt that to establish and compare the cost structures of varying size feedlots the prices used for cattle and feed should be uniform.

With this in mind, weighted average prices of the various feeds were computed.[1/] These weighted average feed costs were introduced into the various feedlot alternative organizations, as well as the following model organizations. Similarly, uniform cattle prices were used for all feedlot

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1/ Weighted according to relative amounts fed.

organizations.

TABLE XXVII. UNIFORM CATTLE PRICES FOR ALL FEEDLOT ORGANIZATIONS.

Item	Price In per Hundredweight	Price Out per Hundredweight
	Dollars	Dollars
Steer Calves	26.00	24.00
Heifer Calves	24.00	23.00
Yearlings	23.00	23.00

Model Feedlot Size I (90 Head Capacity)

On the basis of the various alternatives considered, it appears that the type of operation most feasible for this size feedlot would be that of feeding yearlings exclusively with the lot filled to capacity.1/ This model lot is presented here not on the basis of net income, but on the basis of the kind of an operation a feeder, with these facilities and resources, might adopt to lessen his risk and utilize low-value, on-the-farm roughages. The farm-produced calves could be wintered on crop residues, summered on pasture, and put in the feedlot the following fall as yearlings. Additional yearlings would be purchased each fall to fill the lot to capacity. This method is followed by many Montana feeders in order to take advantage of cheap gains through the utilization of crop residues and dry pastures.

A small dry grain roller is included in this operation, showing a favorable return on the investment by reducing non-feed cost per pound of gain by 1.1 cents over a similar operation without the roller.

1/ The summary table for feedlot size I, Alternatives III and IVE is found in Appendix A.

Cattle

The yearlings are in the lot about 165 days and gain 2.48 pounds per day. Assume a death loss of one yearling.

TABLE XXVIII. TOTAL CATTLE COST AND RECEIPTS FOR MODEL FEEDLOT SIZE I.

	Date	No.	Kind	Weight	Price Per Cwt.	Price Per Head	Total Price
				Pounds	Dollars	Dollars	Dollars
Cattle Cost	Nov. 1	91	Yearlings	650	23.00	149.50	13,605.00
Cattle Receipts	Apr. 15	90	Yearlings	1060	23.00	243.80	21,942.00

Feed

The ration for the yearlings consists of dry rolled barley, molasses, alfalfa, straw, protein supplement, and salt. It usually took about two weeks to put the cattle on full feed. Once full feeding had been attained, each animal was consuming about one pound of protein supplement per day. The grain is fed through a self-feeder and the roughage is fed through bunks.

TABLE XXIX. FEED AMOUNTS AND COSTS FOR MODEL FEEDLOT SIZE I.

Item	Total Amount	Price in Town/Ton	Price on Farm/Ton	Total Cost
	Tons	Dollars	Dollars	Dollars
Barley	111	32.40	30.40	3,374.00
Molasses	8	60.00	60.00	480.00
Straw	10	12.00	11.00	110.00
Alfalfa	40	22.75	21.75	870.00
Protein Supplement	7	85.00	85.00	595.00
Bedding Straw	20	12.00	11.00	220.00
Salt	.6	40.00	40.00	24.00
Total Feed Cost				5,673.00
Total Feed Cost per Head Sold				63.03

Operating Costs

The operating costs for this model are somewhat less than for a similar organization without a dry grain roller.[1] Upon purchase of a dry roller all in-town milling charges and some machinery repair and gas and oil expenses are eliminated.

TABLE XXX. OPERATING COSTS FOR MODEL FEEDLOT SIZE I.[a]

Item	Amount
Spray	$ 30.00
Machinery repair and maintenance[b]	50.00
Gas and oil[b]	42.00
Corral repair	18.00
Electricity	58.00
Telephone	5.00
Veterinary and medicine	108.00
Taxes (cattle)	90.00
Death loss (1 months feed cost for 1 head)	10.00
Transportation	42.00
Total Operating Cost	$453.00

a/ Upon filling the lot to capacity some operating costs would change on a per head basis and, assuming some excess capacity, other costs would remain unchanged from the present organization.

b/ Assumed to increase 50 percent per head added from the present organization.

Interest Expenses

Interest charges will be six percent of the investment in feed, cattle, and the equipment purchased for feeding. Interest will only be charged for the months the cattle are in the feedlot.

1/ For computations see Appendix B, p. 95.

TABLE XXXI. INTEREST CHARGES FOR MODEL FEEDLOT SIZE I.

Total cattle investment	$13,605.00
Total feed investment	5,673.00
Total	$19,278.00
$\frac{\$19,278.00 \times .06}{12} \times 6$ months	$579.00
Equipment--$240.00 x .06[a/]	14.00
Roller--$800.00 x .06	48.00
Total Interest Charges	$641.00

a/ These equipment interest charges will remain unchaged from the present organization.

Summary

In summation (Table XXXII) of the costs and returns for this model of feedlot size I, two aspects concerning economies involved in feeding become apparent. Initially, when comparing the present organization with an organization having the lot filled to capacity, the non-feed costs per pound of gain, for the lot at capacity, can be reduced.[1/] Secondly, when considering an organization similar to the model but without a dry roller, it was shown that the purchase of the roller reduced non-feed cost per pound of gain 1.1 cents.[2/] The total cost per pound of gain was computed by dividing the pounds of beef produced into total expenses, excluding the cost of the cattle.

1/ Op. Cit., Alternatives I, II, and III, Non-feed Cost per Pound Gain.

2/ Ibid., Alternatives III and IVE.

TABLE XXXII. FINANCIAL SUMMARY FOR MODEL FEEDLOT SIZE I.

Total Receipts			$21,942.00
Cattle Expense		$13,605.00	
Other Expenses:			
Feed	$5,673.00		
Operating	453.00		
Depreciation	111.00		
Interest	641.00		
Total Other Expenses		6,878.00	
Total Expenses			20,483.00
Net Income to Labor and Management			$ 1,459.00
Net Income per Head Sold			16.21
Pounds of Beef Produced		36,900	
Total Cost per Pound Gain			18.64¢
Feed Cost per Pound Gain			15.37¢
Non-feed Cost per Pound Gain			3.27¢

With the organization of the model feedlot in mind, a brief consideration of possible changes that might occur are as follows:

Situation #1: A ten cent change in the price of 100 pounds of barley (or $2/ton). This would fluctuate the total feed cost by $222. (111 tons of barley x $2/ton = $222.). Likewise, this would affect the Interest Expense by $7. ($222. x .06 x 6 mos. = $7.).

A. A reduction of ten cents in barley prices would increase net income $229.00 or $2.54 per head.

B. An increase of ten cents in barley prices would decrease net income $229.00 or $2.54 per head.

Situation #2: A one-quarter pound change in daily gain (present daily gain is 2.48 pounds per day).

A. A reduction of one-quarter pound per daily gain reduces

total sale weight from 1,060 pounds to 1,019 pounds. This reduces total receipts by $849.00 ($1,019. x $23/cwt. = $234.37 x 90 head = $21,093). Other costs remaining the same, this would reduce net income from $16.21 per head to $6.77 per head.

B. An increase of one-quarter pound per daily gain would have a like effect of raising net income $849.00 or to $25.64 per head.

Model Feedlot Size II (175 head capacity)

On the basis of the net incomes of the various alternatives considered, it appears that the feedlot filled to capacity with yearlings would serve as a model for this size feedlot.[1/] Many Montana feeders prefer to feed yearlings as the death loss probability over calves is lessened, as is the problem of getting the cattle on full feed.

This model is different from the present organization in that it feeds yearlings only, and the lot is filled to capcity during the winter feeding season. Also, a portable dry grain roller, which rolls, mixes, and unloads the feed directly into the feed bunks is introduced, as it appears to be more profitable than a similar operation without the dry roller. The purchase of the roller reduces non-feed cost per pound of gain by 1.1 cents.

1/ The Summary Table for Feedlot Size II, Alternatives III and IVE is found in Appendix A.

Cattle

The yearlings are in the lot about 173 days and gain 2.52 pounds per day. Assume a death loss of two yearlings.

TABLE XXXIII. TOTAL CATTLE COST AND RECEIPTS FOR MODEL FEEDLOT SIZE II.

	Date	No.	Kind	Weight	Price per Cwt.	Price per Head	Total Price
				Pounds	Dollars	Dollars	Dollars
Cattle Cost	Nov. 1	175	Yearlings	660	23.00	151.80	26,565.00
Cattle Receipts	Apr. 22	173	Yearlings	1095	23.00	251.85	43,570.00

Feed

The ration for the yearlings consists of dry rolled barley, molasses, alfalfa, corn silage, protein supplement, and salt. It usually took about two weeks to put the cattle on full feed. Once full feeding had been attained each animal was consuming about one pound of protein supplement per day. The grain and roughage are fed through fence-line feed bunks.

TABLE XXXIV. FEED AMOUNTS AND COSTS FOR MODEL FEEDLOT SIZE II.

Item	Total Amounts	Price in Town/Ton	Price on Farm/Ton	Total Cost
	Tons	Dollars	Dollars	Dollars
Produced Barley	100	32.40	30.40	3,040.00
Purchased Barley	105	32.40	32.40	3,402.00
Molasses	9	60.00	60.00	540.00
Alfalfa	66	22.75	21.75	1,436.00
Corn Silage	269	7.00	6.00	1,614.00
Protein Supplement	14	85.00	85.00	1,190.00
Bedding Straw	37	12.00	11.00	407.00
Salt	1.1	40.00	40.00	44.00
Total Feed Cost				11,673.00
Total Feed Cost per Head Sold				67.47

Operating Costs

The operating costs for this model are less than for a similar organization without a dry grain roller.[1/] Upon purchase of a dry roller all in-town milling charges and some machinery repair and gas and oil expenses are eliminated.

TABLE XXXV. OPERATING COSTS FOR MODEL FEEDLOT SIZE II.

Items	Amount
Spray	$ 43.00
Machinery repair and maintenance	140.00
Gas and oil	155.00
Corral repair	57.00
Electricity	62.00
Telephone	16.00
Veterinary and medicine	135.00
Marketing (Commissions)	435.00
Transportation	193.00
Taxes	182.00
Death loss	20.00
Total Operating Cost	$1,438.00

Interest Charges

Interest charges will be six percent of the investment in feed, cattle, and the equipment purchased for feeding. Interest will only be charged for the months the cattle are in the feedlot.

TABLE XXXVI. INTEREST CHARGES FOR MODEL FEEDLOT SIZE II.

Total Cattle investment	$26,565.00
Total feed investment	11,673.00
Total	$38,238.00

1/ For computations see Appendix B, p. 95.

TABLE XXXVI. INTEREST CHARGES FOR MODEL FEEDLOT SIZE II. (Continued)

$\frac{\$38,238.00 \times .06}{12}$ x 6 months	1,148.00
Equipment--$1,033.00 x .06[a/]	62.00
Interest on roller	90.00
Total Interest Charges	$1,300.00

a/ These equipment interest charges will remain unchanged from the present organization.

Summary

In summation (Table XXXVII) of the costs and returns for this model feedlot size II, as in the model for feedlot size I, two aspects concerning economies of feeding become apparent. Initially, when comparing the present organization with an organization having the lot filled to capacity, non-feed cost per pound of gain can be reduced as the feedlot is filled to capacity.[1/] Secondly, when comparing an organization similar to the model, but without a dry roller, it was shown that the purchase of the roller reduced non-feed cost per pound of gain 1.1 cents.[2/] The total cost per pound of gain was computed by dividing the pounds of beef produced into total expenses, excluding the cost of the cattle.

TABLE XXXVII. FINANCIAL SUMMARY FOR MODEL FEEDLOT SIZE II.

Total Receipts			$43,570.00
Cattle Expense		$26,565.00	
Other Expenses:			
Feed	$11,673.00		
Operating	1,438.00		

1/ Op. Cit., Alternatives I, II, and III, non-feed cost per pound gain.

2/ Ibid., alternatives III and IVE.

TABLE XXXVII. FINANCIAL SUMMARY FOR MODEL FEEDLOT SIZE II. (Continued)

Depreciation	394.00		
Interest	1,300.00		
Total Other Expenses		14,805.00	
Total Expenses			41,370.00
Net Income to Labor and Management			2,200.00
Iet Income per Head Sold			12.72
Pounds of Beef Produced		75,255	
Total Cost per Pound Gain			19.67¢
Feed Cost per Pound Gain			15.51¢
Non-feed Cost per Pound Gain			4.16¢

With the model feedlot organization in mind a brief consideration of possible changes that might occur within the model operation and their effects are as follows:

Situation #1: A ten cent change in the price of 100 pounds of barley ($2/ton); such a fluctuation would affect the net income by $435.00 (205T x $2. = $410; $410. x .06 = $25; $410. + $25. = $435.). The affect on income per head would be $2.51.

Situation #2: A one-quarter pound change in the present daily gain of 2.52 pounds.

A. A reduction of one-quarter pound daily gain reduces sale weight from 1,095 pounds to 1,056 pounds. This reduces total receipts by $1,552.00 or net income per head by $8.97 (173 head x 1,056 lbs. x $23.00 = $242.88 per head or total receipts of $42,018). Therefore, total net income per head would drop from $12.72 to $3.75.

B. An increase of one-quarter pound per day gain would increase

sale weight to 1,134 pounds and sale price to $260.82 per head. (173 x $260.82 = $45,122. or increase net income $1,552. or $8.97 per head.)

Model Feedlot Size III (320 head capacity)

On the basis of net income to labor and management it appears that a possible model for this size feedlot would include year-round feeding of both calves and yearlings with the purchase of a portable combination dry roller and feed mixer.[1/] The income was higher with the purchase of a power feeding box, but the differential wasn't enough to be of major importance.[2/] The portable roller and mixer is equipped with a self-unloader (auger type) which would serve the same function as the power feeding box, although delivery time might be somewhat slower. This model for feedlot size III is different from the present organization in that the lot is filled to capacity all year around. The lot is filled with calves in November, which are fed till June. The lot is then refilled with yearlings which are fed through October.

Cattle

The calves are in the lot about 212 days and gain 2.01 pounds per day. The yearlings are in the lot about 153 days and gain 2.81 pounds per day. Assume a death loss of three calves and three yearlings.

1/ See summary tables showing alternative II for feedlot size III in Appendix A.

2/ For computations see Appendix B, p. 96.

TABLE XXXVIII. TOTAL CATTLE COSTS AND RECEIPTS FOR MODEL FEEDLOT SIZE III.[a/]

	Date	No.	Kind	Weight	Price per Cwt.	Price per Head	Total Price
				Pounds	Dollars	Dollars	Dollars
Cattle Cost	Nov. 1	160	Steer Calves	415	26.00	107.90	$17,264.00
	Nov. 1	160	Heifer Calves	400	24.00	96.00	15,360.00
	June 2	320	Yearlings	650	23.00	149.50	47,840.00
Total Cattle Cost							$80,464.00
Cattle Receipts	June 1	158	Steer Calves	850	24.00	204.00	$ 32,232.00
	June 1	159	Heifer Calves	820	23.00	188.60	29,987.00
	Oct. 31	317	Yearlings	1080	23.00	248.40	78,743.00
Total Cattle Receipts							$140,962.00

a/ With this size feedlot ten different alternatives, not presented herein, were considered. Of those alternatives studied, it appeared that the organizations which fed on a year-round basis, keeping the feedlot at capacity, seemed to be the most profitable. The following alternative is one such operation. This operation filled the lot with calves November 1, feeding them till June 1, then filled it with yearlings, feeding them till October 31.

Feed

The ration for the cattle consists of dry rolled barley, alfalfa, corn silage, protein supplement, and salt. In general, it was found that the yearlings consumed about as much feed as did the calves in about 50 less days. It usually took about four weeks to put the calves on full feed and about two weeks for the yearlings. Once full feeding had been attained, each animal was consuming about one pound of protein supplement per day. The grain and roughage are fed through fence-line feed bunks.

TABLE XXXIX. FEED AMOUNTS AND COSTS FOR MODEL FEEDLOT SIZE III.

Item	Total Amounts	Price in Town/Ton	Price on Farm/Ton	Total Cost
	Tons	Dollars	Dollars	Dollars
Produced barley	100	32.40	30.40	3,040.00
Purchased barley	650	32.40	32.40	21,060.00

TABLE XXXIX. FEED AMOUNTS AND COSTS FOR MODEL FEEDLOT SIZE III. (Continued)

Item	Total Amounts	Price in Town/Ton	Price on Farm/Ton	Total Cost
	Tons	Dollars	Dollars	Dollars
Alfalfa	282	22.75	21.75	6,134.00
Corn Silage	1,052	7.00	6.00	6,312.00
Protein Supplement	44	85.00	85.00	3,740.00
Bedding Straw [a]	63	12.00	11.00	693.00
Salt	5	40.00	40.00	200.00
Total Feed Cost				$41,179.00
Total Feed Cost per Head Sold				64.95

a/ Bedding straw for calves only, as the yearlings are fed during the dry part of the year.

Operating Costs

The operating costs for this model are less than for a similar organization without a dry grain roller.[1] Upon purchase of a dry roller all in-town milling charges and some machinery repair and gas and oil expenses are eliminated.

TABLE XL. OPERATING EXPENSES FOR MODEL FEEDLOT SIZE III.[a]

Items	Amount
Spray	$ 186.00
Machinery repair and maintenance[b]	150.00
Gas and oil[b]	169.00
Corral repair	145.00
Electricity	128.00
Telephone	108.00
Veterinary and medicine	883.00
Marketing (Commissions)	1,756.00
Death loss (1 months feed cost for 6 head)	60.00
Transportation	729.00
Insurance	42.00
Taxes[c]	320.00
Labor (583 hours x $1.50/hr.)	875.00

1/ Ibid.

TABLE XL. OPERATING EXPENSES FOR MODEL FEEDLOT SIZE III. (Continued)

Items	Amount
Total Operating Cost	$5,551.00

a/ When filling the lot to capacity twice each year some operating costs will increase on a per head basis, such as spray, veterinary and medicine, commissions, cattle transportation, and labor. Other costs such as corral repair, electricity, and insurance will remain unchanged, or change only slightly. Machinery repair and maintenance and gas and oil costs will increase 50 percent per head added because as more cattle are fed the amount of farm produced feed that has to be rolled in town remains unchanged. The increased feed supplies necessary are feeds purchased on a delivered basis.

b/ On the 50 percent per head added basis.

c/ Cattle that are in the lot March 1.

Interest Charges

Interest charges will be six percent of the investment in feed, cattle, and the equipment purchased for feeding. Interest on the feed and cattle will be charged for six months, as only one-half of that money is in use at any one time.

TABLE XLI. INTEREST CHARGES FOR MODEL FEEDLOT SIZE III.

Total Cattle Investment	$ 80,464.00
Total Feed Investment	41,179.00
Total	$121,643.00
$\frac{\$121,643.00 \times .06}{12} \times 6$ months	$3,650.00
Equipment--$1,504.00 x .06[a/]	90.00
Interest on roller	90.00
Total Interest Charges	$3,830.00

a/ These equipment interest charges will remain unchanged from the present organization.

Summary

In summation (Table XLII) of the costs and returns of this model feedlot size III, a reduction is shown in non-feed cost per pound of gain when the lot is filled to capacity.[1] Also, when comparing an organization similar to the model, but without a dry grain roller, the non-feed costs per pound of gain are reduced 1.3 cents.[2] The total cost per pound of gain was computed by dividing the pounds of beef produced into the total expenses excluding the cost of the cattle. The feed and non-feed costs per pound of gain were found in a similar manner.

TABLE XLII. FINANCIAL SUMMARY FOR MODEL FEEDLOT SIZE III.

Total Receipts			$140,962.00
Cattle Expense		$80,464.00	
Other Expenses:			
Feed	$41,179.00		
Operating	5,551.00		
Depreciation	649.00		
Interest	3,830.00		
Total Other Expenses		51,209.00	
Total Expenses			131,673.00
Net Income to Labor and Management			$ 9,289.00
Net Income per Head Sold			14.65
Pounds of Beef Produced		271,820	
Total Cost per Pound Gain			18.84¢
Feed Cost per Pound Gain			15.15¢
Non-feed Cost per Pound Gain			3.69¢

1/ Op. Cit., alternative I, Appendix A.

2/ Ibid., alternatives I and II.

An examination of the following situations are illustrative of possible changes that could happen to the model organization.

Situation #1: A ten cent change in the price of barley ($2/ton); such a change would fluctuate net income by $1,590.00 or by $2.50 per head (750T x $2. = $1,500. x .06 = $90; $1,500. + $90. = $1,590.).

Situation #2: A one-quarter pound per day change in the rate of gain. This change would alter the per head selling weight 52 pounds on calves and 38 pounds on yearlings. This would change the income as follows:

Steer calves--52 pounds x 159 head = 8,268 pounds x 24¢ =		$2,084.00
Heifer calves-52 pounds x 158 head = 8,216 pounds x 23¢ =		1,890.00
	Calf total	$3,974.00
Yearlings-----38 pounds x 317 head =12,046 pounds x 23¢ =		2,770.00
	All cattle total	$6,774.00

Total effect on income with a change in the rate of gain of one-quarter pound per head per day equals $6,744.00 or $10.63 per head.

Model Feedlot Size IV (520 head capacity)

This size lot is different from the smaller size lots in that its dependence on farm produced feed is minor compared to the feed purchased. The effect of higher priced purchased feeds is quite evident in comparison with the smaller lots. For example, feed cost per head in the first size Model Feedlot is approximately $5.00 cheaper than in this larger lot.

Since the major pieces of feeding equipment, such as the dry roller and power feeding box, were found to be in use within the existing feedlots of this size, the major alternative to feeders of this size seemed to be to vary

the degree of utilization of their existing facilities.[1] As presented within the present feedlot organization, the "typical" lots of this size were feeding at about 85 percent of capacity and were empty through the summer months. It, therefore, seems that filling the feedlot to capacity on a year-round basis should result in a higher income to the feedlot's management. This year-round feeding for the model will consist of feeding yearlings exclusively, with a monthly turnover of about 85 head, and a yearly feedlot turnover of twice. The major shortcoming of this plan is this writer's use of a constant cattle price throughout the year. It is realized that yearling prices vary anywhere from $19.00 to $26.00 per hundredweight over the year. However, $23.00 per hundredweight is used to facilitate computations, and it is hoped that this price represents a "typical" price for yearlings through the year.

Cattle

Each yearling is in the feedlot for about 180 days and gains 2.44 pounds per day. Assume a death loss of ten head.

TABLE XLIII. TOTAL CATTLE COST AND RECEIPTS FOR MODEL FEEDLOT SIZE IV.[a]

	Date	No.	Kind	Weight	Price per Cwt.	Price per Head	Total Price
				Pounds	Dollars	Dollars	Dollars
Cattle Cost	Year	1040	Yearlings	605	23.00	139.15	$144,716.00
Cattle Receipts	Year	1030	Yearlings	1045	23.00	240.35	$247,560.00

a/ With this size feedlot as with lot III, several alternatives, not presented herein, were investigated. On the basis of income and feeder's opinions expressed during the course of the interviews, the two alternatives presented will represent organizations most feasible for this size feedlot. The first organization consisted of filling the lot to capacity with calves in the fall, feeding them till June 1, then refilling the lot with yearlings which are fed till about the end of October. (See Appen. A)

1/ Summary tables Feedlot Size IV, alternatives I and II are found in Appendix A.

Feed

The ration for the cattle consists of dry rolled barley, alfalfa, corn silage, protein supplement, and salt. In general, it took about two weeks for the cattle to be put on full feed, and once that level of feeding had been attained each animal was consuming about one pound of protein supplement per day. The grain and roughage are fed through fence-line feed bunks.

TABLE XLIV. FEED AMOUNTS AND COSTS FOR MODEL FEEDLOT SIZE IV.

Item	Total Amount Tons	Price in Town/Ton Dollars	Price on Farm/Ton Dollars	Total Cost Dollars
Produced Barley	252	32.40	30.40	$ 7,661.00
Purchased Barley	1000	32.40	32.40	32,400.00
Alfalfa	330	22.75	21.75	7,178.00
Purchased Alfalfa	182	22.75	22.75	4,141.00
Corn Silage	1540	7.00	6.00	9,240.00
Protein Supple.	92	85.00	85.00	7,820.00
Bedding Straw a/	140	12.00	11.00	1,540.00
Salt	6	40.00	40.00	240.00
Total Feed Cost				$70,220.00
Total Feed Cost per Head Sold				68.17

a/ For 520 yearlings in the lot during the winter months.

Operating Costs

When filling the feedlot to capacity twice each year, it is apparent that some costs will increase on a per head basis such as spray, veterinary and medicine, market commissions, cattle transportation, and labor. Other costs such as corral repair and insurance will remain unchanged, or change only slightly. Machinery repair and maintenance and gas and oil costs will increase 50 percent per head added, because as more cattle are fed the amount of farm produced feed that has to be hauled remains unchanged. The increased

feed supplies necessary are usually purchased on a delivered-to-the-farm basis.

TABLE XLV. OPERATING EXPENSES FOR MODEL FEEDLOT SIZE IV.[a/]

Items	Amount
Spray	$ 177.00
Machinery repair and maintenance[a/]	569.00
Gas and oil[a/]	695.00
Corral repair	140.00
Electricity	369.00
Telephone	145.00
Veterinary and Medicine	915.00
Marketing (Commissions)	2,781.00
Death loss (1 months feed cost for 10 head)	100.00
Transportation (Cattle)	824.00
Insurance	95.00
Taxes (On cattle in lot March 1)	649.00
Labor (300 hours x $1.50/hr.)[b/]	450.00
Total Operating Cost	$7,909.00

a/ On a 50 percent per head added basis.

b/ From the farm interview data.

Interest Charges

Interest charges will be six percent of the investment in feed, cattle, and the equipment purchased for feeding. Interest on the feed and cattle will be charged for six months, as only half of that money is in use at any one time.

TABLE XLVI. INTEREST CHARGES FOR MODEL FEEDLOT SIZE IV.

Total Cattle Investment	$144,716.00
Total Feed Investment	70,220.00
Total	$214,936.00
$\frac{\$214,936.00 \times .06}{12}$ x 6 months	$6,448.00
Equipment--$3,247.00 x .06 a/	195.00
Total Interest Charges	$6,543.00

a/ These equipment interest charges remain unchanged from the present organization.

Summary

In summation (Table XLVII) of the costs and returns for this model feedlot size IV, a reduction is shown in non-feed costs per pound of gain when the lot is filled to capacity.1/ The total cost per pound of gain was computed by dividing the pounds of beef produced into the total expenses, excluding the cost of the cattle. The feed and non-feed cost per pound of gain were found in a similar manner.

TABLE XLVII. FINANCIAL SUMMARY FOR MODEL FEEDLOT SIZE IV.

Total Receipts			$247,560.00
Cattle Expense		$144,716.00	
Other Expenses:			
Feed	$70,220.00		
Operating	7,909.00		
Depreciation	789.00		
Interest	6,543.00		
Total Other Expenses		85,561.00	
Total Expenses			230,277.00
Net Income to Labor and Management			17,283.00
Net Income per Head Sold			16.78

1/ Ibid.

TABLE XLVII. FINANCIAL SUMMARY FOR MODEL FEEDLOT SIZE IV. (Continued)

Pounds of Beef Produced	453,200	
Total Cost per Pound Gain		18.88¢
Feed Cost per Pound Gain		15.49¢
Non-feed Cost per Pound Gain		3.39¢

An examination of the following situations are illustrative of possible changes that could happen to the model organization.

Situation #1: A ten cent change in the price of barley ($2/ton) would change net income by $2,654.00 or $2.58 per head (1,252 tons x $2. = $2,504; $2,504. x .06 = $150; $2,504. + $150. = $2,654.).

Situation #2: A one-quarter pound change in the rate of gain would change the yearlings' selling weight by 43 pounds. This would change net income by $10,187. or $9.89 per head (1,030 head x 43 pounds = 44,290 pounds x .23 per hundredweight = $10,187.).

Summary of the Model Feedlot Organizations

The principal income and cost figures for the model feedlot organizations are summarized in Table XLVIII.

TABLE XLVIII. INCOME AND COSTS PER POUND OF GAIN FOR THE MODEL FEEDLOT ORGANIZATIONS.

	Feedlot Size			
	I	II	III	IV
Net Income per Head Sold	$16.21	$12.72	$14.65	$16.78
Total Cost per Pound Gain	18.64¢	19.67¢	18.84¢	18.88¢
Feed Cost per Pound Gain	15.37¢	15.51¢	15.15¢	15.49¢
Non-feed Cost per Pound Gain	3.27¢	4.16¢	3.69¢	3.39¢
Feeding Ratio a/	1.0	1.0	2.0	2.0

a/ Ratio of head fed to capacity.

In comparison to the present organizations the net income per head and total cost per pound of gain figures for the model feedlots are more favorable and uniform for each lot size.[1] This uniformity is for the most part explained by the uniform cattle and feed prices used in each model organization.

With reference to the feed costs of the different size feedlots, it has been stated that as lot size increased the proportion of purchased feed to total feed fed increased, thereby increasing feed cost per head because of the variance in types and sources of feed. The feed costs per head for the present and model feedlots are shown graphically in Figure 7.

The differences in the feed costs per head between the present and model feedlot organizations are explained by the introduction of the uniform feed prices in the model feedlots. With the introduction of these uniform feed prices, the per head feed costs for the smallest lot increased slightly while the per head feed costs for the largest lot were reduced. Also, it should be noted that the feed cost per head curves as shown in Figure 7 are similar to the discontinuous cost functions as referred to in Chapter I.

With reference to Table XLVIII, the principal savings incurred are noticed in the differences in the non-feed costs per pound of gain as the feedlots are filled to capacity and a dry roller is added to process the barley. For example, for lot size I the reduction in non-feed cost per pound of gain between the present and model organizations is 1.21 cents when going from 50 to 100 percent capacity. For lot size III a similar reduction in non-feed costs amounting to 2.32 cents per pound of gain occurs when going from 75 to

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1/ Page 53.

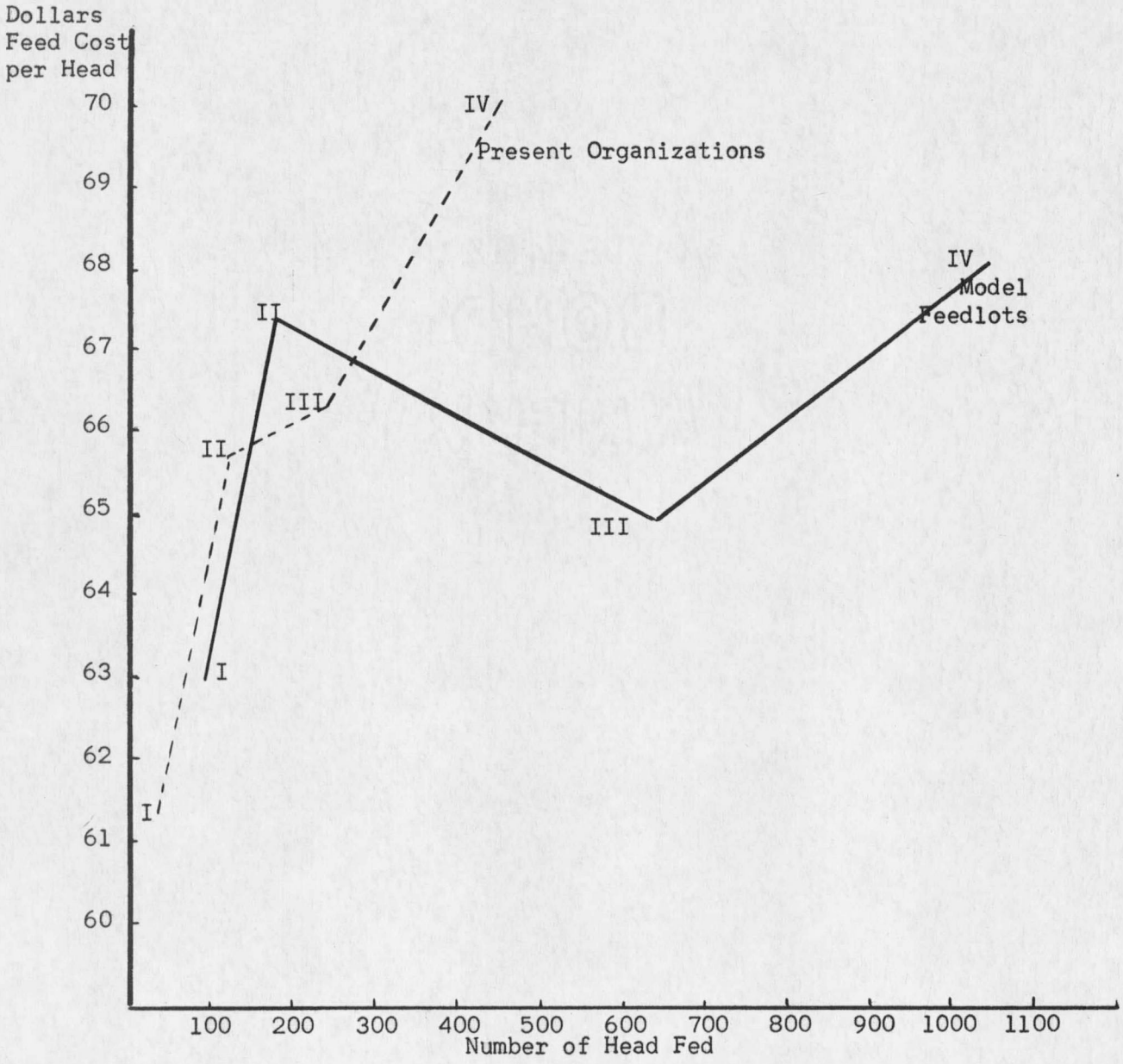


Figure 7. Feed Cost per Head for the Present and Model Feedlot Sizes I-IV.

200 percent of capacity.[1] The addition of the dry roller accounts for approximately one-half of the above cost reductions depending on lot size and consequent degree of utilization.

1/ Non-feed costs per pound of gain for all alternatives studied are found in Appendix A.

CHAPTER III

SUMMARY AND CONCLUSIONS

Summary

In general, it was found that the smaller feedlots, feeding less than 200 head of cattle, were established on the dryland grain farms. These smaller lots appeared to be of a wholely "supplemental" nature to the farm business.1/ For the most part, the cattle were fed farm produced feed, and utilized labor that had little or no other opportunity during the winter months. Feeding was discontinued during the summer months so as not to interfere with the farming operations. Within this study, feedlot sizes I and II best represent this smaller supplemental type of feedlot enterprise.

In consideration of the larger feedlots studied, feeding 200 to 500 head, it was found that these lots were mostly in the irrigated valleys and were of a more "primary" nature to the farm business.2/ These larger lots utilized both farm produced and purchased feeds, required hired labor in some instances, and usually more elaborate facilities than did the smaller lots. Feedlot sizes III and IV represent these primary enterprises in the farm business.

With reference to the "supplemental" and "primary" types of enterprises, we should take not of the essential characteristic of each. While the per unit costs of a small and larger Montana farm feedlots may or may not be the

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1/ A "supplemental" enterprise may be defined as an enterprise that can be added to the farm business without changing the output of any of the farm's other enterprises.

2/ A "primary" enterprise may be defined as an enterprise which contributes a substantial portion of the farm's income and is a chief consideration when planning the farming operations, as it uses a major portion of the farm's resources.

same, figure-wise, the cost structure in relation to the operator's decision making is entirely different. A supplemental enterprise, which most often uses a minor part of a farm's resources, is fitted in with the farm's other more important primary enterprises in a manner which is dictated by the resources required by those major enterprises, including the operator's managerial time. A supplemental enterprise, then, is a secondary consideration in farm planning.

In contrast, a primary enterprise uses a major portion of the farm's resources and contributes a substantial portion of the farm's income. With this in mind, the farm operator first pays his fullest attention to this kind of enterprise. Thus, in this study, it is recognized that, depending on feedlot size, the timing, sequence and consequence of the operator's decision making can be very different. Referring to the hypothetical feedlots' opportunity cost surface in Chapter One, the discontinuities in opportunity costs can be very real when a Montana farm feeder has a small, supplementary type of feedlot enterprise, and spring planting time dictates that he devote his time to crops.[1/] Further opportunity cost discontinuities can occur when the farm feedlot approaches a size where, to profit from the feedlot investment, the feeding enterprise competes on an equal basis with the other farming enterprises in terms of resource use and income generation, thereby becoming a primary enterprise.

One of the several differences between feeding on dryland and irrigated farms was the composition of the rations. On the irrigated farms corn silage

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1/ Page 23.

was a major portion of the ration, whereas, on the dryland farms hay and straw replaced corn silage in the ration. The information obtained by the interviews was not conclusive as to which ration, with or without corn silage, was the least expensive. With the data available, it appeared that both rations cost approximately the same; the main cost differences depending on what proportion of the rations was purchased. Farm produced feed was in all cases cheaper than equal quality purchased feed.

It was apparent that as the feedlots increased in size the proportion of farm produced feed to total feed fed decreased. With increasing amounts of purchased feed in the ration, feed cost per pound of gain increased as the quality and sources of feed varied.

A second important problem for all sizes of feedlots was their marketing procedures. This study revealed that the Montana farm feeder has three marketing channels open to his use. These channels include: (1) The local private packer, (2) the local auction yards, (3) shipping to an out-of-state terminal market.

In general, it was found during the course of the interviews, that the dryland farmer-feeder has more time to deal with marketing than the irrigated farmer-feeder seemed to have. The dryland feeder favored selling to private local packers or shipping to out-of-state terminal markets. The irrigated farmer-feeders didn't seem to have much time to spend on marketing and consequently patronized the local auction markets almost exclusively.

Effects of Constant Prices

Recognizing that feed and cattle prices varied between feedlots, one of the assumptions of this study was to introduce weighted average feed prices

and constant cattle prices into all feedlot organizations. The major reason for doing so was the fact that the feed and cattle price differentials could not be assigned to any one feedlot size or geographic area. The constant feed and cattle prices introduced into this study, in effect, standardized the feed and cattle costs of each lot studied, thereby eliminating any economies that might have existed in conjunction with large scale or seasonal buying of cattle and feed, thus permitting a test of the influence of size of feedlot on costs.

The major effect of introducing constant feed and cattle prices into the analysis was to narrow the field of study down to what economies might exist concerning the operating and fixed expenses of the feedlot enterprise, and to expose any non-price economies that might be gained by the larger lots.

Varying the Degree of Feedlot Utilization and its Effect on Non-feed Costs

In consideration of the non-feed expenses of the feedlot enterprises studied, a significant cost difference occured when the lot was filled to capacity as opposed to feeding at some level below capacity. In all the feedlots studied the present organizations were feeding below capacity--the ratio of head fed to feedlot capacity being .50, .68, .75, and .86 for lot sizes I through IV respectively. The first alternative considered for each feedlot size filled the feedlot to capacity with an organization unchanged from that which was found to exist. Upon filling the lot to capacity the non-feed costs were found to decrease .5, .4, 1.4, and 1.1 cents per pound of gain for lot sizes I through IV respectively. This non-feed cost reduction, as capacity is more fully utilized, compared favorably with a similar comparison

for the four feedlot sizes considered in the California study by Hopkin. In that study the average daily gain per head divided into the average daily non-feed costs per head resulted in non-feed cost per pound of gain figures that were only slightly different than those in this study.

Another important cost consideration is the investment costs in feedlot facilities per head capacity as the feedlot increases in size. The present value of the investment in feedlot facilities per head capacity was $7.43, $11.50, $9.28 and $9.54 for lot sizes I through IV respectively.1/

The lower cost in lot size I illustrated the nominal investment cost needed to feed 100 head or less; the majority of the equipment needed was already present on the farm. If the equipment needed under the various feedlot organizations were used exclusively by the feedlot, the investment cost per head would be $22.43, $19.82, $14.79, and $13.30 for lot sizes I through IV respectively. This inverse relationship of investment cost per head as feedlot size increases compared favorably with similar figures for the four sizes of feedlots in the California study. The difference in the investment cost figures between this study and the California study is partly explained by the fact that land cost for the feedlot was omitted in this study.

Economies Associated with Operating Costs

As mentioned in Chapter I the alternatives open to Montana farm-feeders regarding cost reducing and/or income increasing practices and equipment are rather limited. Upon examining the various operating costs of the feedlots, it appeared that there were few that could be changed significantly. In all

1/ See Table II, Appendix C, p. 99.

cases the grain rolling charges involved in having the grain steam rolled in town by a local miller represented a major portion of the total operating costs. In addition to the almost standard three to four dollars per ton rolling charge, the feeders incurred the costs of getting the farm produced feed to and from town. On the basis of the above cost considerations it appeared that one of the major alternatives that a farm feeder could consider was the purchase of a small grain dry roller. This alternative was introduced into lot sizes I, II and III, only, as lot size IV has a roller unit with the present organization. Considering all cost changes, a significant cost reduction occured upon introduction of the dry roller. Non-feed costs were reduced from .80 to 2.7 cents per pound gain depending on lot size and degree of roller utilization.

On the basis of a cent reduction in cost per pound of gain on a beef animal which gains 400 pounds in the feedlot, an increase in income of four dollars per head will result. This saving can be substantial as the number of head fed is increased. Considering the return on the roller investment alone, after all cost changes, it was found that a farm feeder could pay for the roller unit in one to two years depending on how intensively the roller was used. Comparing the total cost reduction to the roller's investment cost, the return on the investment ranged from 18 to 235 percent for the feedlots in which the roller was introduced.

Another piece of equipment considered in this study was a power feeding box. The introduction of the power box reduced cost per pound of gain slightly. Although the cost reduction with the addition of the power box was favorable, it was apparent that the feedlots studied were of insufficient

size to utilize this piece of equipment efficiently. Consequently, the power feeding box was omitted in the model feedlot for lot size III.

Conclusions

The primary assumption back of the analysis which influenced the following conclusions should be made explicit.

On the farm, cattle feeding is frequently an integral part of the farming program, providing a market outlet for crop by-products and other feeds that would be difficult to market otherwise, as well as providing manure which may be needed for soil maintenance. These important complementary relationships have had to be ignored in this study's analysis of economies of farm feedlots.

This writer is of the opinion that the major economies occur when feeding output is in excess of 1,000 head per year. As suggested in the study by Hopkin, economies that are involved in cattle feeding are associated with job specialization, precision milling and feeding equipment, and the bargaining power of the firm.

Labor specialization occurs when the feedlot becomes of sufficient size that, for example, one man can spend his entire time mixing feed while another devotes full time to handling of cattle. In many feedlots of very large size, the full time services of a veterinarian, an animal nutritionist, and a marketing specialist are common.

With modern precision feeding mills and feeding equipment, it is evident that to cover the initial expense of this equipment the investment costs must be spread over a large number of cattle before this equipment can show any economies.

As a feedlot increases in size, and can turn out cattle of a uniform type, the bargaining power of the feedlot's management is enhanced in the selling of the cattle. This is especially true when a feedlot is of sufficient size to provide a packer with the kind of cattle the packer desires. Also, the bargaining power of a feedlot is enhanced in cattle purchasing when it can bid on a large lot of cattle at any one time.

Considering the small number of large feedlots in Montana, it will be some time before the above economies associated with large scale feeding are fully realized.

The main usefulness of the procedure and data used in this study will serve the reader as a basic guide to the cost structure of Montana farm-feedlot operation. The individual farm feeder can evaluate his specific feedlot cost structure in terms of cash and non-cash, fixed and variable, feed and non-feed costs, using this study as a guide as to what these costs include. Of particular use to an individual feeder, when considering enterprise alternatives, is the added cost--added income approach as shown on the summary tables.1/

During the course of the interviews the opinion was frequently expressed by feeders that they thought their total costs per pound of gain were in the neighborhood of 15 to 17 cents. This study shows that when considering all costs, the cost per pound of gain is actually in the 18 to 20 cent range.

Although any economies that might have been associated with large scale feed and cattle purchasing and selling were removed from this study through

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1/ For added returns, added expenses, and percent return on added income see the summary tables in Appendix A.

constant prices, this does not reduce the emphasis concerning the necessity of Montana's farm feeders to plan their marketing operations. As feeding is intensified, timing of marketing operations isn't a matter of convenience but of necessity, especially when feeding becomes a primary consideration to the farming business. It cannot be overemphasized that to utilize investment costs to their optimum, most of the facilities of feeding should be used most of the time, provided greater returns to other investments aren't given up in the process.

One method used by many Montana feeders, in lessening the risk of buying cattle, makes use of an "order buyer".[1/] It was expressed by these feeders that once they started using the services of an order buyer they wouldn't go back to buying their own cattle. The order buyer has the facilities and knowledge to get the kind of cattle a farm feeder wants, while oftentimes the farm feeder has neither the time nor knowledge to find the kind of feeder cattle he wants for the price he wants to pay.

Another important aspect of Montana farm feeding is the method of barley preparation whether it be steam rolled, dry rolled, ground or pelleted. While this analysis showed a favorable cost reduction with the use of a dry roller, this method of barley milling is not fully acceptable to many Montana feeders. These feeders hold the opinion that steam rolled barley is superior to dry rolled barley in terms of palatability and efficiency of feed utilization. As of this date no conclusive evidence has come out of any source regarding the relative merits of dry and steam rolled barley. This suggests

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1/ An "order buyer" is a person who makes a business of buying and selling cattle on customer order.

that more research is needed in the field of animal nutrition in comparing the merits of different procedures used in feed grain processing.

In general, the growth of farm cattle feeding in Montana appears to be on a slow uphill trend, although it is becoming somewhat more competitive with other states for both cattle and feedstuffs. Those feeders that are (1) able to secure their purchased feeds at the lowest possible market price and still maintain feed quality, (2) take economic advantage of labor saving equipment, and (3) keep their feedlot reasonably filled with cattle throughout the year, stand a good chance of being financially successful in the years ahead. This assumes, of course, that these same feeders have, or can acquire, the knowledge and experience required to buy and sell cattle judiciously and get efficient gains in the feedlot.

APPENDICES

TABLE I. SUMMARY TABLE FOR FEEDLOT SIZE I--ALTERNATIVES

	Orig. Organ.	Orig. Org. with Const. C&F Prices	Alt. I-Lot at Cap.-½ Calves & ½ Yearlings	Alt. II Lot at Cap. All Calves	Alt III Lot at Cap. All Yearlings	Alt. IVA Orig. Org. with Roller	Alt. IVB Constant Prices & Roller	Alt. IVC Lot at Cap. ½ Cal.-Year. & Roller	Alt. IVD Lot at Cap. All Calves & Roller	Alt. IVE Lot at Cap. Yearlings & Roller
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10) Model
Total Receipts a/	8,691.00	9,404.00	20,375.00	18,409.00	21,942.00	8,691.00	9,404.00	20,375.00	18,409.00	21,942.00
Total Expenses a/	8,568.00	8,703.00	18,924.00	16,913.00	20,887.00	8,424.00	8,559,00	18,519.00	16,508.00	20,483.00
Net. Inc. to Lbr. & Mgt. a/	123.00	701.00	1,451.00	1,496.00	1,055.00	267.00	845.00	1,856.00	1,901.00	1,459.00
Net Income per head a/	2.73	15.58	16.12	16.62	11.72	5.93	18.77	20.62	21.12	16.21
% Ret. on Total Invest.	1.44	8.05	7.67	8.85	5.25	3.17	9.87	10.02	11.52	7.12
Added Rec. over Col. 2 a/	----	----	10,971.00	9,005.00	12,538.00	----	----	10,971.00	9,505.00	12,538.00
Added Exp. over Col. 2 a/	----	----	10,221.00	8,210.00	12,148.00	----	----	9,816.00	7,805.00	11,780.00
Added Inc. over Col. 2 a/	----	----	750.00	795.00	354.00	----	----	1,155.00	1,200.00	758.00
% Ret. on Added Invest.	----	----	6.94	9.68	2.91	----	----	11.76	15.37	6.40
Total Cost/Pound Gain b/	18.37	19.05	18.99	18.07	19.73	17.65	18.33	17.94	17.06	18.63
Feed Cost/Pound Gain b/	13.79	14.45	14.75	14.16	15.37	13.79	14.45	14.75	14.16	15.37
Non-feed Cost/Pound Gain b/	4.58	4.60	4.14	3.91	4.36	3.86	3.88	3.19	2.90	3.26

a/ Figures in dollars.

b/ Figures in cents.

TABLE II. SUMMARY TABLE FOR FEEDLOT SIZE II--ALTERNATIVES

	Original Organ.	Orig. Org. with Const. C&F Prices	Alt. I-Lot at Capacity Calves & Yearlings	Alt. II Lot at Cap. All Calves	Alt. III Lot. at Cap. All Yearlings	Alt. IVA Orig. Org. with Roller	Alt. IVB Constant Prices & Roller	Alt. IVC Lot at Cap. Calves & Year. & Rol.	Alt. IVD Lot at Cap. All Calves & Roller	Alt. IVE Lot at Cap. All Year. & Roller
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10) Model
Total Receipts a/	26,008.00	26,799.00	40,399.00	33,398.00	43,570.00	26,008.00	26,799.00	40,399.00	33,398.00	43,570.00
Total Expenses a/	25,094.00	26,011.00	39,110.00	32,581.00	42,175.00	24,614.00	25,531.00	38,305.00	31,776.00	41,370.00
Net Inc. to Lbr. & Mgt. a/	914.00	788.00	1,289.00	817.00	1,395.00	1,394.00	1,268.00	2,094.00	1,622.00	2,200.00
Net Income per Head a/	7.68	6.62	7.45	4.72	8.06	11.71	10.66	12.10	9.38	12.72
% Ret. On Total Invest.	3.64	3.03	3.30	2.50	3.31	5.66	4.97	5.47	5.10	5.32
Added Rec. over Col. 2 a/	----	----	13,600.00	6,599.00	16,771.00	----	----	13,600.00	6,599.00	16,771.00
Added Exp. over Col. 2 a/	----	----	13,099.00	6,570.00	16,164.00	----	----	12,294.00	5,765.00	15,359.00
Added Inc. over Col. 2 a/	----	----	501.00	29.00	607.00	----	----	1,306.00	834.00	1,412.00
% Ret. on Added Invest	----	----	4.96	.44	3.76	----	----	10.62	14.47	9.19
Total Cost/Pound Gain b/	20.49	20.91	20.69	20.78	20.74	19.56	19.97	19.62	19.43	19.67
Feed Cost/Pound Gain b/	15.07	15.39	15.56	15.68	15.51	15.07	15.39	15.56	15.68	15.51
Non-feed Cost/Pound Gain b/	5.42	5.52	5.13	5.00	5.23	4.49	3.58	4.06	3.75	4.16

a/ Figures are in dollars.

b/ Figures are in cents.

TABLE III. SUMMARY TABLE FOR FEEDLOT SIZE III--ALTERNATIVES.

	Present Organization (1)	Pres. Organ. with Constant Cattle & Feed Prices (2)	Alt. I-Lot at Cap. Year-Round Calves and Yearlings (3)	Alt. II--Lot at Cap. Yr. Rd. Calves-Yrl. & Roller (4)	Alt III-Lot at Cap. Yr. Rd. Calv-Yrl. Roll&Pwr.Box (5)
				Model	
Total Receipts a/	51,528.00	54,346.00	140,962.00	140,962.00	140,962.00
Total Expenses a/	52,116.00	53,947.00	135,195.00	131,673.00	130,938.00
Net Inc. to Lbr. and Mgt.a/	-588.00	399.00	5,767.00	9,289.00	10,024.00
Net Income per Head a/	-2.48	1.68	9.10	14.65	15.81
% Ret. on Total Invest.	---	---	4.27	7.05	7.65
Added Rec. over Col. 2 a/	---	---	86,616.00	86,616.00	86,616.00
Added Exp. over Col. 2 a/	---	---	81,248.00	77,726.00	76,991.00
Added Inc. over Col. 2 a/	---	---	5,368.00	8,890.00	9,625.00
% Ret. on Added Invest.	---	---	6.61	11.44	12.50
Total Cost per Pound Gain b/	20.63	21.83	20.13	18.83	18.57
Feed Cost per Pound Gain b/	14.62	15.44	15.15	15.14	15.15
Non-feed Cost/Pound Gain b/	6.01	6.39	4.98	3.69	3.42

a/ Figures are in dollars.

b/ Figures are in cents.

TABLE IV. SUMMARY TABLE FOR FEEDLOT SIZE IV ALTERNATIVES

	Present Organ. (1)	Pres. Org. with Const. Cattle and Feed Prices (2)	Alt. I-Lot at Capacity Calves & Yearlings (3)	Alt. II-Lot at Capcity Year-Round Yearlings (4) Model
Total Receipts[a/]	101,671.00	102,408.00	220,790.00	247,560.00
Total Expenses[a/]	93,058.00	96,227.00	207,857.00	230,277.00
Net Inc. to Lbr. & Mgt.[a/]	8,613.00	6,181.00	12,933.00	17,283.00
Net Income per Head[a/]	19.36	13.89	12.56	16.78
% Ret. on Total Invest.	9.26	6.42	6.23	7.51
Added Ret. over Col. 2[a/]	---	---	118,382.00	145,152.00
Added Exp. over Col. 2[a/]	---	---	111,700.00	134,120.00
Added Inc. over Col. 2[a/]	---	---	6,682.00	11,032.00
% Ret. on Added Invest.	---	---	5.98	8.23
Total Cost/Pound Gain[b/]	19.40	19.47	19.36	18.88
Feed Cost/Pound Gain[b/]	15.04	14.97	16.04	15.49
Non-feed Cost/Pound Gain[b/]	4.36	4.50	3.32	3.39

a/ Figures are in dollars

b/ Figures are in cents.

APPENDIX B

THE PURCHASE OF A STATIONARY GRAIN DRY ROLLER FOR FEEDLOT SIZE I.

The roller's capacity is about 1.5 tons per hour and will be used between one and two hours per day. Its initial cost is $800.00 and its expected life is 15 years.

Additional Costs:

1.	Repair--2% of initial cost (annually)	$16.00[1]
2.	Interest--6% of $800.00	48.00
3.	Depreciation--Straight line method (10% salvage)	48.00
4.	Electricity--5¢ per day for 200 days	10.00[2]

Cost Reductions:

1. All in-town rolling costs are eliminated.
2. The gas and oil, machinery repair and maintenance costs for hauling the grain to town will be figured at one-half the custom rates of $2.00 per ton of grain hauled, for an average haul of 10 miles. The total cost reduction will be allocated approximately equally between machinery repair and maintenance and gas and oil expenses.

THE PURCHASE OF A PORTABLE DRY ROLLING UNIT FOR FEEDLOT SIZE II.

This piece of equipment utilizes a Bearcat roller, and is equipped with a small mixing tank and a self-unloader. The initial cost is $1,500.00 and its expected life is 15 years.

Additional Costs:

1.	Repair--2% of initial cost (annually)	$30.00[1]
2.	Interest--6% of %1,500.00	90.00
3.	Depreciation--Straight line method (10% salvage)	90.00
4.	Electricity--5¢ per day for 210 days	10.00[2]

Cost Reductions:

1. All in-town rolling costs are eliminated.
2. The gas and oil, machinery repair and maintenance costs for hauling the grain to town will be figured at one-half the custom rate of $2.00 per ton of grain hauled, for an average haul of 10 miles. The total cost reduction will be allocated approximately equally between machinery repair and maintenance and gas and oil expenses.

1/ Hopkin, op. cit., p. 19

2/ Estimates from the interviews.

THE PURCHASE OF A PORTABLE DRY GRAIN ROLLING UNIT FOR FEEDLOT SIZE IV.

This piece of equipment utilizes a Bearcat roller, and is equipped with a small mixing tank and a self-unloader. The initial cost is $1,500.00 and its expected life is 15 years.

Additional Costs:

1.	Repair--2% annually of initial cost	$30.00[1/]
2.	Interest--6% of $1,500.00	90.00
3.	Depreciation--Straight line method (10% salvage)	90.00
4.	Electricity--5¢ per day for 365 days	18.00[2/]

Cost Reductions:

1. All in-town rolling costs are eliminated.
2. The gas and oil, machinery repair and maintenance costs for hauling the grain to town will be figured at one-half the custom rate of $2.00 per ton of grain hauled for an average haul of 10 miles. The total cost reduction will be allocated approximately equally between gas and oil and machinery repair and maintenance expenses.

THE PURCHASE OF A POWER FEEDING BOX TO FACILITATE DELIVERY OF THE FEED TO THE CATTLE FOR FEEDLOT SIZE III.

It is assumed that this equipment will eliminate the extra labor cost involved in this size feedlot. The initial box costs $175.00 (mounted on a $1\frac{1}{2}$ ton truck). The feeding attachment costs $525.00, and the fertilizer spreading attachment cost is $300.00. Total unit costs equals $1,000.00. Expected life is 15 years.

Additional Costs:

1.	Repair--2% annually of initial cost	$20.00[1/]
2.	Interest--6% of $1,000.00	60.00
3.	Depreciation--Straight line method (10% salvage)	60.00

Cost Reductions:

1. The addition of the power box will eliminate the labor cost involved in feeding. This labor cost is paid to labor other than the owner-operator. No labor charge is recognized for the owner-operator, as it is assumed the operator's winter labor used in feeding has no opportunity cost.

1/ Hopkin, op. cit., p. 19.

2/ Estimates from the interviews.

TABLE I. DISTRIBUTION OF THE CATTLE FEEDLOTS IN MONTANA BY CATTLE ON FEED JANUARY, 1961.[a/]

Area	Range in Number of Head on Feed									
	1-49	49-99	100-199	200-299	300-399	400-499	500-999	1000-1999	2000-2999	3000+
Northwestern	24	15	5	4	---	1	---	---	---	---
North Central	50	48	24	6	---	2	3	---	---	---
Northeastern	44	39	35	11	---	2	2	---	---	---
Central	15	18	9	6	6	2	4	1	---	---
Southwestern	2	9	4	---	1	1	3	---	---	---
South Central	43	54	37	18	3	8	4	4	---	---
Southeastern	14	11	5	1	1	---	---	---	1	2
Total	192	194	119	46	11	16	16	5	1	2
State Total										602

a/ United States Department of Agriculture, Crop and Livestock Reporting Service, Helena, Montana.

TABLE II. SELECTED CHARACTERISTICS OF SAMPLED FEEDLOTS.

	Feedlot Size			
	I	II	III	IV
Average Feed Yard Capacity	90	175	320	520
Average Number of Head Fed During the Year	45	110	240	450
Ratio of Average Number Fed to Average Capacity	.5	.63	.75	.86
Total Number of Farm Feedlots in the Group	11	18	16	10
Average Daily Gain per Head (Lbs.)				
Calves	2.12	1.90	2.25	2.08
Yearlings	2.48	2.63	2.52	2.44
Average Investment in Feedlot Facilities per Head Fed	14.86	16.90	12.52	11.14
Average Investment in Feedlot Facilities per Head Capacity	7.43	11.50	9.28	9.54

TABLE III. 1960-61 INVESTMENT IN CORRALS FOR THE FEEDLOTS.

Item	Size	Cost/ Unit	Feedlot Size I Amt.	Feedlot Size I Total Cost	Feedlot Size II Amt.	Feedlot Size II Total Cost	Feedlot Size III Amt.	Feedlot Size III Total Cost	Feedlot Size IV Amt.	Feedlot Size IV Total Cost
		Dollars		Dollars		Dollars		Dollars		Dollars
Tie Posts	6'	.75	75	56.00	140	105.00	280	210.00	375	281.00
Railing	2"x8"	70/1000	1800'	126.00	2750'	192.00	5500'	385.00	10300'	721.00
Windbreak	1"x12"	60/1000	2400'	144.00	3200'	192.00	4800'	288.00	6400'	384.00
Nails	Asstd.	14/cwt.	300 lbs.	42.00	600 lbs.	84.00	1200 lbs.	168.00	2000 lbs.	280.00
Gate(s)	12'	12.	1	12.00	2	24.00	4	48.00	6	72.00
Chute	---	25.	1	25.00	1	25.00	1	25.00	1	25.00
Waterer	---	90.	1	90.00	2	180.00	4	360.00	6	540.00
Gravel	---	1.50/yd.	30 yds.	45.00	60 yds.	90.00	120 yds.	180.00	200 yds.	300.00
Feed Bunks										
Planking	2"x8"	70/1000	400'	40.00	2250'	158.00	4400'	316.00	4400'	316.00
Planking	2"x10"	70/1000	200'	20.00	1100'	77.00	2200'	154.00	2200'	154.00
Self-feeder	---	200.	1	200.00	---	---	---	---	---	---
Totals				800.00		1127.00		2134.00		3073.00

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