A planning guide for fattening cattle
by D Bawden

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

Abstract:
This thesis is presented in the form of a guide which dryland wheat farmers may use in planning a supplementary cattle fattening enterprise.

Because of the nature of the subject, this guide cannot be a precise step-by-step process, which, if followed, will bring about an exact result.

It is, rather, a loose, somewhat pliable framework which can be used in an effort to maximize specific results. The underlying assumption is that, regardless of the project, one must follow some semblance of order or little good will be derived.

A study of this type is timely for three reasons: (1) the dryland wheat farmer is searching for a profitable use of his surplus labor during the winter months; (2) he already possesses many of the facilities required in cattle feeding; and (3) he has had little or no experience in this type of operation. For the first two reasons, it is predicted that many wheat farmers will begin a winter cattle fattening program. For the last reason, a guide is needed to assist the inexperienced feeder in his venture.

On the following pages the problem is first discussed, analyzed and limited. A general discussion follows on the aspects and processes involved in pre-budget planning. Finally, the guide is formulated, and a hypothetical feeding operation is created to explain its use.

Because this is a subjective, presupposing study, it has no definite conclusion. Yet, after reading it, one can hardly visualize a profitable unplanned feeding operation. Possibly the most significant impression is that profit cannot be realized consistently without planning, and this thesis merely presents a guide by which this planning may be accomplished.

A PLANNING GUIDE FOR FATTENING CATTLE ON DRYLAND WHEAT FARMS IN THE TRIANGLE AREA OF MONTANA

An Analysis of the Procedure for Dryland Wheat Farmers to Follow in Determining the Profitableness of Fattening Cattle During the Winter Months as a Supplementary Enterprise.

by

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ACKNOWLEDGMENTS

In many instances a thesis at the Masters Degree level is of small benefit to the reader but of great benefit to the author. This is especially true of this thesis, for it has been a tremendous help to me--both in increased knowledge of research methods and added inspiration for this type of work.

Because it has been a learning experience, I am deeply indebted to several individuals. My name appears on the cover, and I assume full responsibility for the information contained herein. However, this thesis would never have been written had I not been exposed to the enthusiasm, intellectual stimulation, and inspiration generated by the entire Agricultural Economics Department at Montana State College.

A very special debt of gratitude is owed to Dr. Edward Ward, without whose encouragement I would never have entered graduate work, and Drs. Clarence Jensen and Chester Baker for the patience and assistance they extended to me during the writing of this paper. Warm thanks are also extended to Drs. D. C. Myrick, Roy E. Huffman, Oscar O. Thomas, and David Blackmore, and Professors Bill Ewasiuk and Dean Vaughn for their encouragement and constructive criticism.

ABSTRACT

This thesis is presented in the form of a guide which dryland wheat farmers may use in planning a supplementary cattle fattening enterprise. Because of the nature of the subject, this guide cannot be a precise step-by-step process, which, if followed, will bring about an exact result. It is, rather, a loose, somewhat pliable framework which can be used in an effort to maximize specific results. The underlying assumption is that, regardless of the project, one must follow some semblance of order or little good will be derived.

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PART I

INTRODUCTION

The Problem

The Montana dryland wheat farmer is confronted with a problem in that there are few enterprise alternatives which he may use to supplement his income. If he is to receive a supported price for his wheat, he must observe the acreage allotments imposed upon him by the Federal government; thus approximately one third of his land must be diverted to the production of something other than wheat. Montana farmers usually use this land to raise barley. As a consequence, he is faced with the problem of disposing of this barley in the most profitable manner.

In addition, many dryland wheat farmers have little to occupy their time during the winter months except to repair their machinery. Because of high farm income in the past years, many farmers have placed a higher value on this leisure time than on the profits they could receive from an additional enterprise which would require some of their labor. However, declining farm income in current years suggests that such attitudes may change. It is probable that many will favor spending the winter months operating a supplementary enterprise rather than devoting this time to leisure.

Because of these two existing surpluses--namely, barley and labor--it has been suggested that dryland wheat farmers may be able to carry on a cattle fattening program during the winter months that will

profitably utilize these surpluses. But is this a sound suggestion? Is it actually profitable to carry on a cattle fattening operation as a supplemental enterprise? How can this be determined?

Ideally, a study could be made that would determine exactly what profit, if any, every farmer could make with this supplemental enterprise. However, as is usually the case, the ideal is unattainable. Every farmer is in a different situation in regard to costs, resources, market conditions, knowledge, location, and size of operation. Wheat producers in dryland areas, unaccustomed and ill prepared to weigh alternatives adequately, need a guide to assist them in the determination of the profitableness of fattening cattle under the conditions peculiar to each type of operation.

Objectives

This thesis will attempt to provide a guide for dryland wheat farmers to follow in determining, with some degree of accuracy, the profitableness of fattening cattle during the winter months as a supplementary enterprise. This guide will consist of (1) an elaboration of the areas in which choices must be made by the farmer prior to the feeding operation, and (2) a budget outline in which the farmer may introduce his own costs to determine the marketing margin needed for a profitable operation.

Major Limitations

Because of the time limitation on this study, several major assumptions shall be made before attacking the aforementioned objectives to facilitate a more thorough investigation of a particular phase of the problem. It is hoped that, within these limitations, the study will retain breadth enough to remain practical for a majority of the farmers to whom the overall problem applies.

First, this study will pertain only to farmers having no irrigated land. This restriction is imposed because of the differences between dryland and irrigated farm organizations.

Second, the results of this thesis will be most appropriate to dryland wheat farmers in the Triangle Area of Montana[1/] (see Figure 1). Due to the limitation of available time and money, the study of dryland cattle fattening operations was made only in this area. This section of Montana was chosen because it is one of the major wheat producing areas of the state, and because its environmental conditions are similar to those in a large part of the Northern Great Plains. It is hoped that some of the results of this thesis may be applicable to dryland wheat farms in the Northern Great Plains.

Third, because it is the most common practice, only fattening cattle for slaughter purposes will be considered, as opposed to merely a warm-up feeding operation. Thus, it is reasonable to assume that these

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1/ This area includes most of Chouteau, Fergus, Hill, Judith Basin, Liberty, Teton, and Toole Counties.

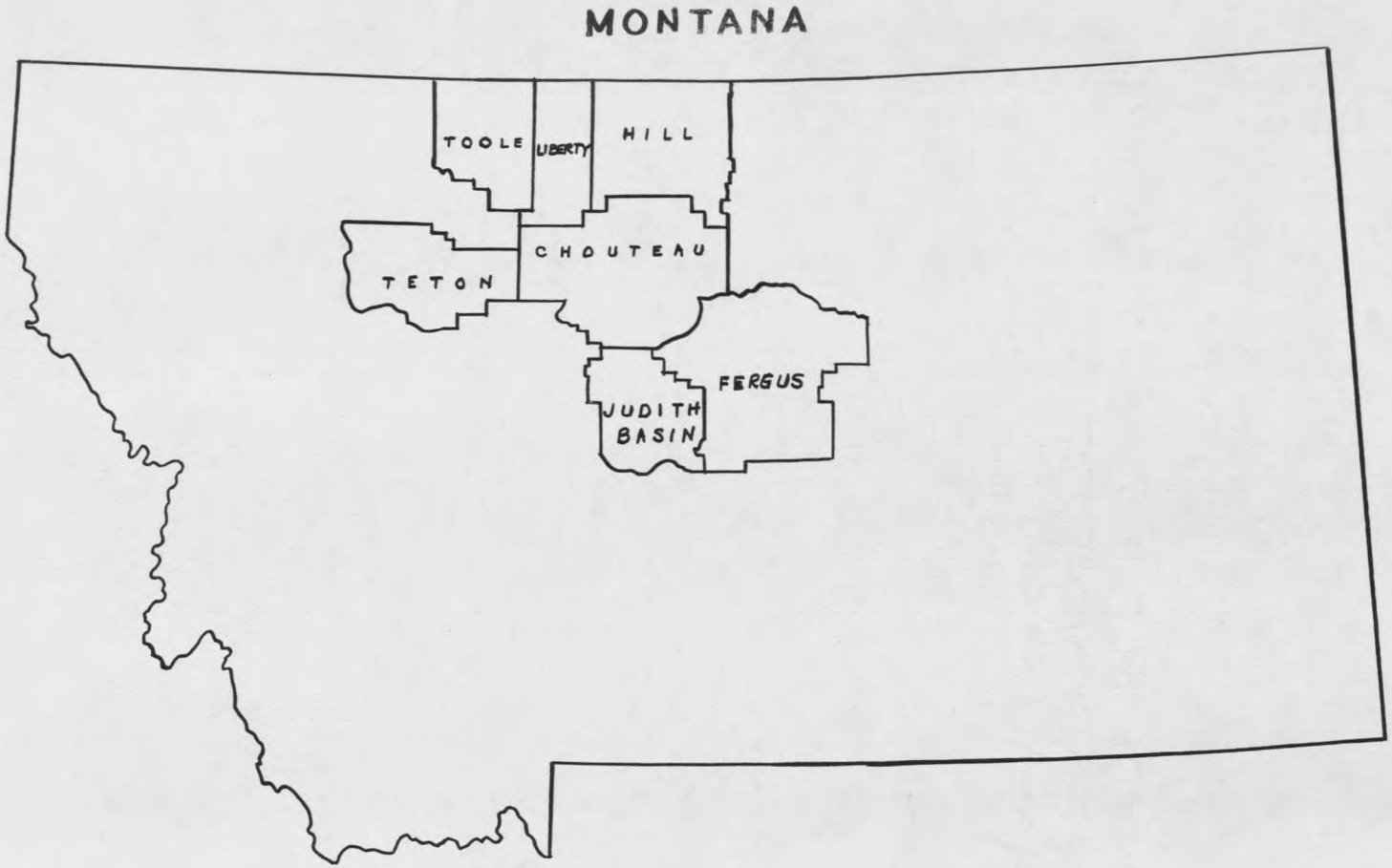

Figure 1. Map of Montana Illustrating the Triangle Area

cattle will be on full feed,[1] instead of a limited ration,[2] so they may reach a desirable slaughter finish.

Fourth, the feeding period shall be limited from approximately September 1 to April 1 because this is the period when most dryland wheat farmers have the largest surplus of labor.

Procedure

This study will be organized in the same manner in which a farmer may proceed to predict intelligently whether or not a cattle fattening program would be a profitable venture for him to undertake.

First, several major areas will be established within which the prospective feeder must make a choice of alternatives. Then a few feasible alternatives within each of these decision-making areas will be proposed, and a choice of one of the alternatives within each area will be made. However, these choices must be made in reference to a particular farm organization; therefore, a hypothetical farm will be described. No claim is made that this farm will be typical of the majority of farms in the Triangle Area, but it will resemble some of those visited while interviewing feeders in this area.

Using the chosen alternatives, a budget will be established which will include all of the expense and receipt items relevant to this

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1/ Full feed means that the cattle will be fed a ration consisting of a large percentage of concentrates to achieve the maximum rate of gain.

2/ Limited ration means that the cattle are fed less concentrates than they require to achieve the maximum rate of gain throughout the entire feeding period.

supplementary enterprise. Then cost and revenue figures will be introduced into the budget to predict the profitability of fattening cattle on this hypothetical farm. The choice of alternatives and the cost and revenue figures will be based upon information from interviews with operators of cattle fattening enterprises in the Triangle Area, data obtained from secondary material available to the author, or in some cases, by assumption.

It must be emphasized that only the method of this prediction process should be used by a prospective feeder. The chosen alternatives and the cost and revenue figures apply only to the hypothetical farm, and, in some cases, they may not even be the wisest choice for this type of organization because some are established only by assumption. Thus, the primary value of using the hypothetical farm in this study is to demonstrate the use of the proposed guide, and it is the responsibility of the prospective feeder to make the above decisions with reference to his own farm organization.

PART II

CHARACTERISTICS OF AREA

The appropriate type of cattle feeding operation is, to a large extent, influenced by the general environmental conditions within which it exists.[1] A very brief discussion of these influencing factors, plus a general description of the type of feeding in the Triangle Area, will be presented below. From this, the reader will better understand the necessity of many of the limitations imposed on the feeding enterprise discussed in Part III.

Climate and Topography

The normal annual precipitation in the Triangle Area ranges geographically from 10 to 21 inches, with 5 to 13 inches of this falling from April 1 to October 1. The average annual mean temperature lies between 40 and 46 degrees Fahrenheit, with an average of 105 to 135 frost-free days.[2] Within each of these characteristics, there is a great deal of variation between years.

Topographically, the Triangle Area is similar to most of the Great Plains in that it consists primarily of level or gently rolling land ranging between 2,000 and 4,000 feet in altitude.[3]

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[1] The influence would be less were it not that this feeding operation is treated as an enterprise supplementing the established farm.

[2] Bolster, H. G. and Stucky, H. R., Montana's Agriculture, Montana Agricultural Extension Service, Bulletin 228, Bozeman, Montana, May, 1945, pp. 7-9.

[3] Ibid., p. 5.

Type of Farming

The Triangle Area is one of the largest wheat producing sections of Montana. Both winter and spring wheat are grown in abundance, and the only other cereal produced in significant quantities is barley. Before acreage restrictions on wheat became effective, comparatively little barley was grown. However, barley production has increased more than 475 percent since that time, and it is now one of the major crops of this area (see Table I).

TABLE I. TOTAL NON-IRRIGATED ACRES HARVESTED IN THE TRIANGLE AREA.[a/]

Year	Barley	Wheat[b/]
1951	99,800	1,938,900
1952	114,600	2,002,000
1953	118,200	2,001,600
1954	475,000	1,598,800
1955	468,800	1,515,600
1956	430,300	1,383,800
1957	577,200	1,384,400

a/ Montana Department of Agriculture, Montana Agricultural Statistics, Montana Department of Agriculture, Helena, Montana, Vol. IV, December, 1952, pp. 47, 49, 51; Vol. V, December, 1954, pp. 18-21, 26, 27; and Vol. VI, December 1956, pp. 32-35, 40, 41.

b/ Both spring and winter; excludes Durum.

Irrigation plays a very small part in the agriculture of this area. Only 4 percent of the harvested crop acres is irrigated, and over one half of this irrigation is located in the southeastern portion of Teton County.[1] In 1954, the average number of acres harvested per farm was 435, but the average number of cultivated acres is nearly twice this amount because most farmers in this area summer fallow one half of their cultivated land each year.[2]

Most of the area, with the exception of Fergus and Judith Basin Counties, possesses glaciated soils ranging from Brown to Chestnut with a loam or clay-loam texture. There is very little organic matter in this type of soil, and the lime is close to the surface; thus, there is little leaching. Small areas of strongly solodized Solonetz soils are scattered throughout the entire glaciated region. The soils of Fergus and Judith Basin Counties fall primarily into the Chestnut and Chernozem groups, i.e., dark brown soils.[3]

Type of Feeding

It is impossible to describe a "typical" cattle fattening operation in the Triangle Area; however some idea can be obtained as to the

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1/ Ibid., Vol. VI, December, 1956, p. 13.

2/ Ibid., pp. 98-99.

3/ For a more specific discussion of the soil types in this area see the Montana Agricultural Experiment Station's Soil Survey (Reconnaissance) of Central Montana, Series 1940, No. 9, Bozeman, Montana, February, 1953, pp. 1-133; and Soil Survey (Reconnaissance) of the Northern Plains, Series 1929, No. 21, Bozeman, Montana, 1933, pp. 1-74.

enterprise organization of many of the operations from information obtained by interviewing individual feeders. Fifty cattle feeders in this area were interviewed during the summer of 1956.[1] Of these 50, only 38 were dryland wheat farmers. The remainder were commercial feeders, or fed on irrigated farms. The data presented will pertain only to the 38 feeders and will include only cattle fed during the winter of 1955-56.

The average number of cattle fed was 67 head, and there was little variation in numbers between areas. Thirty-seven of the 38 feeders fed only on a drylot basis.[2] There was a great deal of variation between areas in the age and sex of cattle fed. In some sections the farmers were partial to feeding heifers while in other localities they favored feeding steers. The same difference in views applies to the age of cattle fed. The percent of operators feeding different groups of cattle is shown in Table II.

A majority of the cattle placed on feed were started during November--the average date being November 16. Twenty-five operators fed cattle they themselves raised, seven purchased them from the sale ring, four bought directly from ranchers, and two supplemented their own cattle with purchases from the sale ring.

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[1] The feeders interviewed were not randomly selected. An attempt was made to interview the entire population of feeders in this area.

[2] Drylot feeding may be defined as the fattening of cattle in an enclosed pen without access to pasture during the feeding operation.

TABLE II. TYPE OF CATTLE FED IN THE TRIANGLE AREA, 1955-1956.

Type of Cattle Fed	Percent of Operators
Steers only	29%
Heifers only	16%
Steers and heifers	55%
Yearlings only	42%
Calves only	34%
Calves and yearlings	11%
Two-year-olds only	5%
Yearlings and two-year-olds	8%

In selling their cattle for slaughter, 23 sold directly to local grocery stores or slaughter plants, nine used the sale ring, five sold to order buyers, and one shipped to St. Paul. The average transportation distance per sale, paid by the seller, was 54 miles (excluding the shipment east).

Most farmers used only two kinds of grain in their ration--either straight barley (55 percent of the feeders) or some combination of barley and oats (40 percent). Only 5 percent of the feeders used a cereal other than the two above. Nearly everyone had the grain steam-rolled with a small amount of molasses mixed in during the rolling process. Sixty-nine percent of the farmers used all home grown grain, 15 percent

purchased less than one fourth of it, and 15 percent purchased all of the grain fed.

There was a great deal of variation in the kinds of hay fed. Sixty-one percent of the feeders included wild hay in their ration, 42 percent included oat hay, 33 percent alfalfa, and 10 percent fed some straw. Very few fed oat or alfalfa silage, and 34 percent fed Stilbestrol.

PART III

PRE-BUDGET PLANNING

The Planning Process

Unfortunately, too many farmers decide to fatten cattle with very sketchy plans of how the feeding operation is to be conducted. Feeding is an extremely complex business, and the intelligent farmer realizes that a great deal of planning and preparation must precede the actual feeding operation.

The primary purpose of feeding is to make money, so it is logical that the first and primary function of planning is to estimate the profitability of the feeding operation. Before this can be done, the potential feeder must first make several choices which will enable him to prepare a budget. This budget should include estimates of every expense involved in the feeding operation. The areas where choices must be made are listed below:

1. Type of feeding
2. Age of cattle
3. Sex of cattle
4. Quality of cattle
5. Weight of cattle
6. Ingredients of ration
7. Amount of ration to feed
8. When to begin feeding
9. Length of feeding period
10. Number to feed
11. Equipment required

A great deal of thought must enter into each of these decisions, and, in certain areas, partial budgets must be prepared to arrive at

the best choice. Also, the farmer must estimate what the weight of the cattle will be at the end of the feeding period. Only after these steps have been taken can the prospective feeder prepare a realistic budget of his total feeding operation.

Let us assume the preliminary budget indicated that it would be financially profitable to feed, the farmer has purchased feeder cattle, fed them a reasonable length of time, and sold them. Now, he must again return to the bookwork before he has satisfactorily completed the entire feeding operation.

After the cattle have been sold for slaughter, the feeder should not only figure carefully his profit or loss, but he should review his decisions to determine why he made such a profit or loss. Also, he should investigate the possibility that, had he chosen different alternatives, he might have made more profit. In other words, he should find the sources of variation in his costs and returns. From this he will be better qualified to decide whether or not to feed the following year, and, if he does, it will help him do so in a more efficient manner.

In an effort to illustrate this process, a hypothetical cattle feeding operation will be planned. This section (Part III) will contain the processes involved in pre-budget planning, and a budget for the fattening enterprise will be prepared in Part IV. However, all planning must be made in reference to a particular farm organization. Therefore, a description of a hypothetical farm is presented on the following page.

The Hypothetical Farm

The farm is located in the Triangle Area, 15 miles from the nearest town. It is composed of 900 acres, all non-irrigated, and is strictly a wheat farm with no livestock or pasture. Thirty of the 900 acres are waste land (farmstead, fences, roads, etc.), leaving 870 acres available for cultivation. Of this, one-half is summer fallowed each year, so only 435 acres may be used for the production of cereal grains, which is the average number of harvested acres per farm in the Triangle Area (see page 9).

Assuming this farm had all 435 acres in wheat before acreage allotments were begun, approximately 70 percent, or 305 acres, can now be planted to wheat. Thus, there are 130 acres remaining to be planted to some feed grain. What is planted will be determined by the ration chosen later in this section.[1/]

Choices to Be Made

As was stated previously, several decisions must be made prior to preparation of the final budget. These areas of decision will be discussed in this section. Alternatives will be developed within each area and a selection will be made of the one alternative best suited to the hypothetical farm organization. These choices will be based upon

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1/ It is significant to note that a farmer should, before spring planting of the preceding year, decide what ration he will feed if conditions are conducive to profitable feeding the following year. Otherwise, if he plants the wrong kind of grain, he may have to trade one type of cereal for another to get the ingredients of a suitable ration.

secondary data, information from those feeders interviewed, logical reasoning, or in some cases, by arbitrary assumption. Their purpose is to provide a basis for preparation of the final budget.

Type of Feeding

In fattening cattle for slaughter, a farmer may feed his cattle either in a drylot or on pasture. As the hypothetical farm has no pasture, only drylot feeding will be considered in the budget.

Another choice to be made is how the cattle will be fed--by hand or by a self feeder. A majority of the farmers interviewed fed by hand; however, some of the most successful practiced self-feeding. The danger in using the self-feeding method at the beginning of the feeding period is that the animals may founder, get diarrhea, or go off feed. Later in the feeding period when the cattle are accustomed to a heavy ration, they can usually eat as much as desired without any ill-effects.

A combination of the two methods will be used in the hypothetical feeding operation. The troughs will be filled by hand and the ration limited during the first part of the feeding period. Later, when the cattle have become accustomed to a concentrated diet, a surplus of grain will be kept in the troughs so they may eat all they desire.

Age of Cattle

Most of the cattle fed at the present time in the Triangle Area are either calves or yearlings. Several experiments have shown that one advantage of feeding calves is that they make cheaper gains than do

yearlings because the food value is utilized for growing instead of fattening. However, they cost more per pound to buy as feeders, their gain per day is less, and they must be fed a longer period of time to reach a desirable finish.[1] Also, calves "require more attention in care and feeding, being more susceptible to inclement weather, digestive disturbances and disease."[2] This indicates that it may not be wise for a beginning feeder to fatten calves until he has had some feeding experience. Therefore, because the farmer's feeding period is limited, and because calves are not so easy to feed, yearlings will be chosen as the age class of cattle to be fed on the hypothetical farm.

Sex of Cattle

Whether heifers or steers are fed will depend upon personal preference, the availability of feeder cattle in the area, the price differential between heifers and steers at buying time, and the expected price differential at selling time. The farmer may choose to feed only one sex or a mixed lot. As these variables cannot be weighed in reference to a hypothetical farm organization, steers will be arbitrarily chosen for this feeding operation.

1/ Morrison, F. B., Feeds and Feeding, Morrison Publishing Company, Ithaca, New York, 21st edition, 1951, pp. 799-800.

2/ Maynard, E. J., Beets and Meat, Great Western Sugar Company, Denver, Colorado, September, 1950, pp. 30-31.

Quality of Cattle

In determining the quality of cattle to buy, a prospective feeder must first decide the grade he would like his fattened cattle to reach at selling time. This will depend upon the existing market in the feeder's locality.

The market for Montana fattened cattle is usually in Montana or the West Coast. Neither of these markets show a strong demand for prime cattle, so an insufficient premium is usually paid for this grade of cattle.[1] Thus, in most cases, it would be unwise for the farmer to feed his cattle with this goal in mind.

Because of this, and because warming up and feeding on a limited ration were eliminated previously for budgeting purposes, the quality of the fattened cattle may be narrowed to either choice or good grade. From this, a low choice will be chosen as the goal for the feeder on the hypothetical farm. Therefore, he will probably want to buy a choice grade feeder. Good grade feeders may be purchased, but they must be fed longer to reach choice at selling time.[2]

This decision to feed to the choice grade should not be interpreted as a recommendation, because this will depend upon the present and expected price margins. If choice feeder cattle are selling at a premium over good grade feeders, and the farmer feels this premium will not be

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1/ Orcutt, E. P., Fattening Montana Cattle, Montana Agricultural Extension Service, Bulletin No. 203, Bozeman, Montana, May, 1953, p. 31.

2/ Ibid., p. 31

so great when he sells his fed cattle, he should buy the good grade feeder.[1] But he must not try to feed them to an extremely high degree of finish. This can only be accomplished through increased feeding costs that may become excessive.

Weight of Cattle

An important step in planning a feeding operation is the determination of the weight of the cattle to buy. This is important because a prospective feeder must also plan the length of the feeding period and the amount of feed that will be needed. If the animals are heavy when they are put on feed, only a short feeding period may be required to reach the choice grade. Conversely, if they are too light, the feeding period may extend into the planting season before a choice grade is reached. This may require the use of man-hours for feeding which are needed for seeding crops. Therefore, it behooves the farmer to give serious consideration to the weight at which to purchase the animals.

If choice feeder yearlings are purchased, they should reach the choice slaughter grade at approximately 930 pounds.[2] So, in determining the weight at which they should be acquired, the feeder must take into consideration the daily rate of gain expected (derived from the type and amount of ration to be fed) and the length of the feeding

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1/ Morrison, F. B., op.cit., p. 842.

2/ Iowa State College Staff, Midwest Farm Handbook, Second Edition, Iowa State College Press, Ames, Iowa, 1951, p. 2.

period appropriate for his farm operation. Of course, this estimated buying weight may vary slightly at the time of purchase according to the weights and prices of feeder cattle available in the area, but a large deviation from the desired weight should be avoided if possible.

Because of choices and estimates made later in this section, the desired weight of the cattle at the beginning of the feeding period in the hypothetical fattening operation will be from 575 to 625 pounds (or an average of 600 pounds for budgeting purposes).

Ingredients of the Ration

One of the more important factors in determining the financial success of a feeding operation is the kind of ration that is used and the amount of this ration that is fed. Only the ingredients of the ration will be discussed here, and the amount to be fed at different intervals during the fattening period will be discussed under the following subheading.

The ingredients of the ration may vary from year to year, depending on the price relationship between the different feeds. Also, they need not be limited to only those feeds which can be home grown, because it is not always known at the time of spring planting what ration will be the best to use during the next winter's feeding operation. If a farmer can profit by selling his home grown feed and purchasing some other kind that will fatten his cattle more economically, he should do so.

Because of the large amount of barley being grown in the Triangle Area, and the need for disposing of it in the most profitable manner,

barley will usually be a part of the ration. Some farmers claim that barley is a poor fattening ration; however, "numerous experiments have shown that fattening cattle will make as rapid gains on ground barley, fed as the only grain, as on shelled corn."[1] If barley is a part of the ration it should be cracked or rolled for cattle and not fed whole or finely ground to obtain the most economical results.[2]

Oats are also grown in abundance in the Triangle Area, so this is another possible cereal to include in the ration. It is especially valuable during the first part of the feeding period because cattle will many times adjust to their partial-grain diet better if it contains some oats. Unlike barley, experiments conducted show that there is no benefit from grinding oats for calves up to one year of age. However, medium-fine grinding is definitely advantageous for older cattle. Finely ground oats are of lower feeding value than are whole oats.[3]

Experiments have shown that when straight barley is fed to one group of cattle all during the feeding period and a similar group is fed straight oats for the entire period, oats are worth only about 86 percent as much as barley. Barley is somewhat higher in protein content and total digestible nutrients than are oats.[4] This suggests that straight oats should not be fed throughout the entire feeding period;

1/ Morrison, F. B., op.cit., p. 515.

2/ Orcutt, E. P., op.cit., p. 14.

3/ Morrison, F. B., op.cit., p. 491.

4/ Ibid., pp. 492, 513.

however, a mixture of oats and barley is sometimes superior to feeding either of the two alone, depending upon the price relationship between the two cereals. If the price of oats is low relative to the price of barley, it is worth as much as barley in a mixed grain ration if it does not exceed approximately 30 percent of the mixture (see Figure 2).

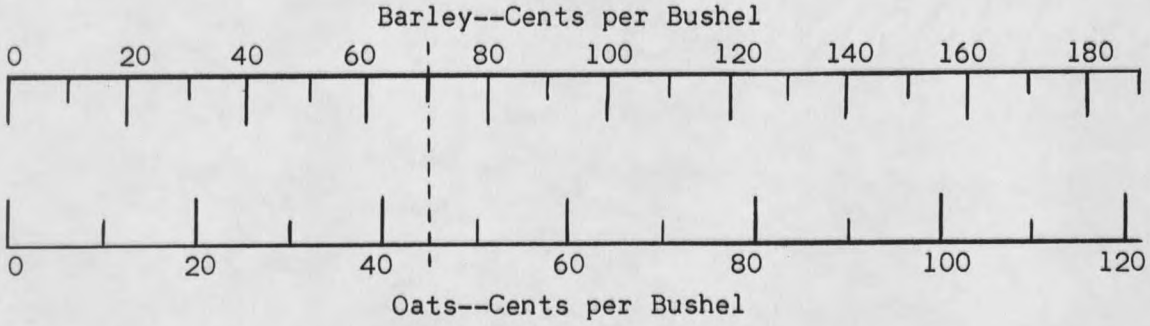

Figure 2. Scale of Prices of Barley and Oats and Their Relative Values for Fattening Beef Cattle.a/

a/ Schruben, L. W. and Clifton, R. E., Grain Substitution in Feeding Livestock, Kansas Agricultural Experiment Station, Circular No. 299, Manhattan, Kansas, July, 1953, pp. 1-5.

As an illustration explaining how to use the scale above, suppose barley is 70 cents per bushel. Place a straight edge vertically at 70 cents on the line marked barley, and it will intersect the scale for oats at 45 cents (see dotted line). Therefore, if oats can be purchased at less than 45 cents per bushel, it would be profitable to feed oats up to 30 percent of the grain ration. If oats are more than 45 cents per bushel, feed straight barley. This, of course, pertains only after the animals are on full feed.

Although this is an excellent guide, the feeder should not rely completely on the price relationship method of determining the ration. Some cattle tire of a straight barley ration over a long feeding period; others may bloat if only barley is fed. In these cases it is wise to mix oats with barley, even if the price is high relative to that of barley.1/

Regardless of the ration chosen to be fed when the cattle are on full feed, it is usually advisable to feed a high percentage of oats at the beginning of the feeding period. Then, as the animals become accustomed to a heavy diet, the proportion of oats may be gradually decreased until the desired proportion of the full-feed ration is obtained.

In some cases, other grains have been and are being used successfully in fattening beef cattle in the Triangle Area, so it should not be inferred that other grains cannot be fed profitably. But because barley and oat production is especially adapted to this area, and because 95 percent of the feeders interviewed fed only barley and/or oats, a detailed discussion of the other grains will not be presented.2/ It will be assumed that barley and/or oats will comprise the grain ration on the hypothetical farm. Furthermore, because this feeding operation is hypothetical, and therefore no realistic price predictions can be

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1/ Morrison, F. B., op.cit., p. 515.

2/ For information pertaining to the value of other grains for fattening livestock, see Part II of Feeds and Feeding by F. B. Morrison, op.cit., pp. 268-632.

made, straight barley will be fed after the cattle have become accustomed to a fattening ration.

At the beginning of the feeding period, the grain ration will consist of 50 percent oats and 50 percent barley, and the percentage of oats will be steadily decreased until the animals are on straight barley in 30 days. Often a partial oat ration appears more appetizing to cattle if they are unaccustomed to concentrates, thus they make a better adjustment to their new feeds, and their consumption increases faster than if they were fed straight barley from the beginning. Here again, there are differences in cattle and in feeding operations. Therefore, this decision must also be left to the individual feeder's judgment.

Molasses is often recommended as an important part of any fattening ration because it serves as an appetizer and has considerable feeding value if fed in small amounts. Experiments at Colorado showed that one pound of beet molasses is equal in feeding value to three fourths of a pound of rolled barley and over one fourth of a pound of hay if fed sparingly.[1/] Because of these nutritive and appetizing qualities, beet molasses will also be included in the ration.

The protein in barley and oats, as in other cereals, is not of good quality, although it is somewhat better than corn.[2/] But from barley

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1/ Singleton, H. P., Ensminger, M. E., and Heinemann, W. W., Dried Molasses-Beet Pulp and Beet Molasses for Fattening Cattle, Washington Agricultural Experiment Station, Bulletin No. 469, Pullman, Washington, September, 1945, pp. 6, 7.

2/ Morrison, F. B., op.cit., p. 514.

and oats the cattle can get enough protein to fulfill their requirements. However, all grains, except yellow corn, have little carotene value (carotene is the component of plants which can be converted to Vitamin A in the animal's body), and there is a definite need for this in a fattening ration. At the present time, there is no known lack of any other vitamin (other than Vitamin A) in feeding beef cattle.[1]

One of the reasons Vitamin A is needed is that a deficiency sometimes causes excessive watering of the eyes and later serious injury to them. The initial symptom is usually night blindness, although convulsions sometimes occur first. Lack of Vitamin A may also cause spasms or paralysis; generalized swelling, or edema, known as "anasarca"; lack of coordination, resulting in a staggering gait; and susceptibility to pneumonia and other respiratory disease.[2]

Cattle do store carotene in their bodies, and they draw upon this when fed a ration with a Vitamin A deficiency. How long they can do this depends upon their body store and their age--calves will show symptoms quicker than will older animals.[3] However, to derive maximum gains it is wise to supply a sufficient amount of carotene during the entire feeding period, because it is impossible to determine the amount of Vitamin A each animal has in storage until the damaging symptoms appear.

1/ Ibid., pp. 140, 786, 788.

2/ Ibid., pp. 141, 788.

3/ Ibid., p. 787.

The Vitamin A requirement may be satisfied by feeding hay or a concentrated Vitamin A supplement. Good quality hay is usually cheaper to feed than a vitamin supplement, and it supplies more dry matter to the ration. The latter is important because cattle on a straight grain ration with an insufficient amount of dry matter may tend to physic or go off feed, resulting in reduced gains. Several farmers interviewed fed straw to supply the necessary dry matter. This is generally not recommended because all straw is very low in mineral, protein, and Vitamin A value. If used at all, it should make up a very small percent of the total ration.[1/]

For the above reasons hay will be included in the ration for the hypothetical farm. A choice must also be made between the different kinds of hay. This choice is influenced by the absence of hay land on the hypothetical farm, for it can be assumed that the feeder must purchase his entire hay requirement. True, land presently used for cereal crops could be diverted to the production of hay. But because of the small amount of roughage needed for the feeding operation, production costs per ton would be unusually high, so greater returns could be derived by raising cereal crops than by raising a small acreage of hay.

At first glance, the choice of what kind of dry roughage to buy is extremely complicated because there are hundreds of different kinds. Actually, the choice is not nearly so difficult because transportation costs eliminate the purchase of hay from a great distance if hay is

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1/ Ibid., pp. 436,437.

available nearby. Thus, the alternatives can be restricted to those roughages grown in the Triangle Area and surrounding territory. These are, according to the interviews, alfalfa, oat hay, and native hay (including brome and crested wheat grasses).

First, a comparison will be made between alfalfa and oat hay. Although mineral and protein content are important, this comparison will be made primarily on the basis of carotene content because the concentrates will supply the necessary amounts of minerals and proteins.

Alfalfa, partly bleached with a moderate amount of green color, will contain nine to 14 milligrams of carotene per pound. Cereal hay of average quality, bleached with some green color, will range from four to eight milligrams of carotene per pound in content. If both possess a bright green color, each will have more carotene value, yet alfalfa will still have twice as much as will oat hay. Also, alfalfa will supply more than twice as much digestible protein per pound.[1/] This indicates that for the above nutrients, alfalfa is twice as valuable, by weight, as oat hay in a fattening ration.

In comparing alfalfa with native hay, the latter has an important advantage in that it is usually considered less bulky.[2/] However, all types of native hay common to this area have considerably less carotene value than does alfalfa. Of these, bromegrass is higher in carotene and

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1/ National Research Council, Recommended Nutrient Allowances for Beef Cattle, Number IV, Washington 25, D. C., December, 1950, pp. 25, 29.

2/ Orcutt, E. P., op.cit., p. 17.

retains its value better in the later stages of development than do most of the other grasses.[1] In addition, all of the native grasses contain only about one half of the digestible protein of alfalfa.

Because alfalfa is the cheapest source of carotene and digestible protein, it will be used for hay on the hypothetical farm. This, however, should not necessarily be considered a recommended practice for two reasons.

First, there is an indication that when both barley and alfalfa are fed, there is a tendency for the animals to bloat.[2] This has not been conclusively proven, but if a farmer's cattle tend to bloat on this combination, he should feed some other roughage in an attempt to prevent it.

Secondly, the quality of roughage is more important than the kind of hay used. Native hay of good quality, i.e. unbleached with a good green color, may have more carotene value than poor quality alfalfa. Alfalfa, standing in stacks for one year, will lose 75 to 85 percent of its Vitamin A value. Baled alfalfa will lose 3 percent of its carotene content per month during the winter, 6 percent per month during the fall and spring, and 21 percent per month during the summer.[3] Therefore, if only a very poor quality of alfalfa is available, the farmer should feed some other roughage of good quality.

1/ Morrison, F. B., op.cit., p. 146.

2/ Orcutt, E. P., op.cit., p. 17.

3/ Ibid., p. 11

Another component of the ration to be used on the hypothetical farm will be diethylstilbestrol (commonly called stilbestrol). Many experiments have been conducted by agricultural experiment stations and other research agencies to determine the optimum amount of this hormone to feed. Results show that each animal on feed should be given approximately 10 milligrams per day for best results.[1/]

Less than one half of the Triangle Area feedlot operators interviewed in 1957 included stilbestrol in the ration. The most common method of feeding stilbestrol was orally in combination with a protein supplement. This is the way in which stilbestrol will be given to the feeder animals on the hypothetical farm.

With the above ration, the digestible protein, total digestible nutrients (TDN), dry matter, and carotene requirements can be fulfilled.

There has been no positive information indicating the need for adding trace minerals (cobalt, copper, iron, manganese, etc.) to a fattening ration in the Triangle Area.[2/] Therefore, the only minerals that may be lacking are sodium, chlorine, calcium, phosphorus, and iodine.

Because legumes are a part of the ration, there will be no lack of calcium if three to four pounds of alfalfa are fed daily. Grain is very

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1/ Chappel, C. F., "Feeding Diethylstilbestrol to Beef Cattle," Proceedings of the 1956 Montana Nutrition Conference, Montana State College, Bozeman, Montana, June, 1956, p. 34.

2/ Orcutt, E. P. Minerals for Montana Cattle and Sheep, Montana Agricultural Extension Service Circular No. 246, Bozeman, Montana February, 1953, p. 7.

low in calcium content, so if little or no legumes are to be fed, a calcium supplement would be needed. Also there should be no phosphorus deficiency in a barley ration because any grain, even if grown on phosphorus deficient soil, will provide an ample amount.[1]

There is a deficiency of sodium and chlorine in most fattening rations. However, if ordinary salt is provided, these requirements will be fulfilled.[2] Loose salt is usually the best to buy because cattle will eat more of it than if it is in block form. If it is directly exposed to the weather, however, block salt should be used because there is less loss. The most satisfactory arrangement is to use loose salt, provide a covering over it to keep out rain and snow, and fasten the container to a building or stand at a reasonable height to reduce the possibility of cattle urinating in it.[3]

It has not yet been proven that additional iodine is needed for feed-lot cattle; however, to add this to the salt is inexpensive and probably should be done to insure the proper amount of iodine in the ration.[4] The best source of iodine is commercial iodized salt if it contains stabilized iodine. If it does not, long storage or exposure to the sun and air for several weeks will result in evaporation of the iodine.

1/ Morrison, F. B., op.cit., pp. 784, 785.

2/ Maynard, E. J., op.cit., p. 64.

3/ Morrison, F. B., op.cit., p. 783

4/ Orcutt, E. P., Fattening Montana Cattle, op.cit., p. 9.

An inexpensive source of iodine is potassium iodide. However, it is recommended that it be mixed with ground rock salt at the rate of one ounce of potassium iodide to 300 pounds of salt.[1] To mix such a small amount of iodine with such a large amount of salt is not only bothersome but time consuming and difficult to perform. Because of this, commercial iodized salt with stabilized iodine will be included in the ration for the hypothetical farm.

This completes the choice of ingredients of a ration for the hypothetical farm. No claim is made that this is the best possible ration to feed, for there are hundreds of other combinations of feeds. An infinite amount could be written to include all the possible feeds and their combinations, but this would be a research study in itself.

Amount of Ration to Feed

If the operation is on a full-feed basis, as is this one, it will be assumed that the object is to feed the cattle as much as they can eat of the optimally proportioned ingredients. The critical issue then becomes in what proportion to feed the ingredients to obtain the most economical gain. The criteria for this decision are: (1) to provide at least the minimum amounts of the "basic elements" (vitamins, proteins, minerals, TDN's, and dry matter); (2) to feed an appetizing ration; and (3) to keep the animal otherwise healthy (i.e. prevent bloat, foundering, diarrhea, etc.).

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[1] Orcutt, E. P., Minerals for Montana Cattle and Sheep, op.cit., p. 4.

These criteria, however, cannot be considered independently. Probably the best method is to attempt to fulfill criterion number one while keeping in mind the other two limitations. In other words, first determine a certain ratio of ingredients that will supply enough of the basic elements. Then check this against criteria two and three using past feeding experience and/or common knowledge as the basis for comparison. Obviously, the planned proportion of ingredients may require changing after observing the effect of the ration on cattle, but this does not reduce the need for a precisely planned ration prior to the beginning of the feeding period.

The provision of minimum amounts of the basic elements can be planned by using as a guide, published information regarding (1) recommended nutrient allowances for fattening cattle and (2) analysis of the composition of ration ingredients. Data of this type, which pertain to this feeding operation, are presented in Tables III and IV. Similar information for all feeds can be obtained by a prospective feeder from several sources, the most common probably being Feeds and Feeding by Frank B. Morrison, or Recommended Nutrient Allowances for Beef Cattle by the National Research Council.

TABLE III. RECOMMENDED DAILY NUTRIENT ALLOWANCES FOR FATTENING YEARLING CATTLE[a]

Weight of Animal (lbs.)	Dry Matter (lbs.)	Digestible Protein (lbs.)	Total Digestible Nutrients (lbs.)	Calcium (lbs.)	Phosphorus (lbs.)	Carotene (Mg.)
600	15.0-17.6	1.18-1.32	10.7-12.3	.044	.037	35
700	16.5-19.1	1.36-1.52	12.7-14.3	.044	.040	40
800	17.8-20.4	1.52-1.68	14.1-15.9	.044	.042	45
900	18.9-21.7	1.64-1.82	15.4-17.2	.044	.044	50
1,000	20.0-23.0	1.71-1.90	16.0-18.0	.044	.044	55
1,100	21.0-24.0	1.76-1.96	16.5-18.5	.044	.044	60

[a] Morrison, F. B., Feeds and Feeding, Morrison Publishing Company, Ithaca, New York, 21st edition, 1951, p. 1149.

TABLE IV. AVERAGE COMPOSITION AND DIGESTIBLE NUTRIENTS OF FEEDS[a]

Feedstuff	Total Dry Matter (%)	Digestible Protein (%)	Total Digestible Nutrients (%)	Calcium (%)	Phosphorus (%)	Carotene mg/lb
Alfalfa hay, all analysis	90.5	10.5	50.3	1.47	0.24	11.4
Alfalfa hay, before bloom	90.5	13.7	53.4	2.22	0.33	--
Alfalfa hay, 1/10 to 1/2 bloom	90.5	11.2	51.7	1.26	0.22	19.4
Alfalfa hay, 3/4 to full bloom	90.5	10.3	50.1	--	--	9.0
Alfalfa hay, past bloom	90.5	9.2	47.6	--	--	3.2
Barley, excluding Pacific Coast	89.4	10.0	77.7	0.09	0.47	--
Molasses, beet	80.5	4.4	60.8	0.08	0.02	--
Oats, excluding Pacific Coast	90.2	9.4	70.1	0.09	0.43	--

[a] National Research Council, Recommended Nutrient Allowances for Beef Cattle, Number IV, Washington 25, D. C., December, 1950, pp. 25-27.

By using Tables III and IV, a trial and error process must be used to determine how much of each ingredient to feed. This may be accomplished as follows:

Step 1. Estimate the number of pounds of each ingredient to feed daily;

Step 2. Multiply the number of pounds of each ingredient by its corresponding percentage in column 1 (Total Dry Matter) of Table IV.

Step 3. Add each of the individual answers arrived at in Step 2 to obtain the total daily pounds of dry matter each animal will receive;

Step 4. Compare this result with the estimates opposite the average weight of the animals being fed (in Table III) to determine whether the minimum requirements are being met;

Step 5. Determine whether this combination of ingredients will normally appear appetizing to the animal and produce no ill-effects (such as bloat, diarrhea, etc.).

The above process must be repeated for all columns in Table IV to arrive at a satisfactory ratio of ingredients. This method was used for the hypothetical feeding operation, and the results are presented in Table V below.

TABLE V. ESTIMATED AMOUNTS OF RATION INGREDIENTS TO BE FED.

Feed	When to Feed	Ingredient	Pounds Fed Daily	Dry Matter (lbs.)	Protein (lbs.)	TDN's (lbs.)	Calcium (lbs.)	Phosphorus (lbs.)	Carotene (mgs.)
		Barley	1.5	1.34	.150	1.17	.0014	.00705	--
1st		Oats	1.5	1.35	.141	1.05	.0014	.00645	--
Day		Molasses	0.3	.24	.013	.18	.0002	.00006	--
		Alfalfa	17.0	15.39	1.785	8.55	.2499	.04080	193.8
			20.3	18.32	2.089	10.95	.2529	.05436	193.8
		Barley	2.5	2.24	.250	1.94	.0023	.01175	--
6th		Oats	2.5	2.26	.235	1.75	.0023	.01075	--
Day		Molasses	.5	.40	.022	.30	.0004	.00010	--
		Alfalfa	15.0	13.58	1.575	7.55	.2205	.03600	171.0
			20.5	18.48	2.082	11.54	.2255	.05860	171.0
		Barley	3.5	3.13	.350	2.72	.0032	.01645	--
11th		Oats	3.5	3.16	.329	2.45	.0032	.01505	--
Day		Molasses	.7	.56	.031	.43	.0006	.00014	--
		Alfalfa	13.0	11.77	1.365	6.54	.1911	.03120	148.2
			20.7	18.62	2.075	12.14	.1981	.06284	148.2
		Barley	6.00	5.36	.600	4.66	.0054	.02820	--
16th		Oats	3.00	2.71	.282	2.10	.0027	.01290	--
Day		Molasses	1.35	1.09	.059	.82	.0011	.00027	--
		Alfalfa	11.00	9.96	1.155	5.53	.1617	.02640	125.4
			21.35	19.12	2.096	13.11	.1709	.06777	125.4
		Barley	7.30	6.53	.730	5.67	.0066	.03431	--
21st		Oats	3.70	3.34	.348	2.59	.0033	.01591	--
Day		Molasses	1.65	1.33	.073	1.00	.0013	.00033	--
		Alfalfa	9.00	8.15	.945	4.53	.1323	.02160	102.6
			21.65	19.35	2.096	13.79	.1435	.07215	102.6
		Barley	8.70	7.78	.870	6.76	.0078	.04089	--
26th		Oats	4.30	3.88	.404	3.01	.0039	.01849	--
Day		Molasses	1.95	1.57	.086	1.19	.0016	.00039	--
		Alfalfa	7.00	6.34	.735	3.52	.1029	.01680	79.8
			21.95	19.57	2.095	14.48	.1162	.07657	79.8

TABLE V. (Continued). ESTIMATED AMOUNTS OF RATION INGREDIENTS TO BE FED.

	Barley	15.00	13.41	1.500	11.66	.0135	.07050	--
31st	Molasses	2.25	1.81	.099	1.37	.0018	.00045	--
Day	Alfalfa	5.00	4.53	.525	2.52	.0735	.01200	57.0
		22.25	19.75	2.124	15.55	.0888	.08295	57.0
	Barley	17.00	15.20	1.700	13.21	.0153	.07990	--
36th	Molasses	2.55	2.05	.112	1.55	.0020	.00051	--
Day	Alfalfa	4.00	3.62	.420	2.01	.0588	.00960	45.6
		23.55	20.87	2.232	16.77	.0761	.09001	45.6
	Barley	18.0	16.09	1.800	13.99	.0162	.08460	--
41st	Molasses	2.7	2.17	.119	1.64	.0022	.00054	--
Day	Alfalfa	4.0	3.62	.420	2.01	.0588	.00960	45.6
		24.7	21.88	2.339	17.64	.0772	.09474	45.6
	Barley	19.00	16.99	1.900	14.76	.0171	.08930	--
46th	Molasses	2.85	2.29	.125	1.73	.0023	.00057	--
Day	Alfalfa	4.00	3.62	.420	2.01	.0588	.00960	45.6
		25.85	22.90	2.445	18.50	.0782	.09947	45.6
	Barley	20.0	17.88	2.000	15.54	.0180	.09400	--
51st	Molasses	3.0	2.42	.132	1.82	.0024	.00060	--
	Alfalfa	4.0	3.62	.420	2.01	.0588	.00960	45.6
		27.0	23.92	2.552	19.37	.0792	.10420	45.6

A table similar to that above should be prepared by a prospective feeder. Here the amounts to be fed are figured for five-day intervals. This, of course, does not mean that only 2.5 pounds of barley be fed each day for the first five days and then increased to 3.5 pounds on the sixth day. The cattle will be fed 2.5 pounds the first day, and the amount will be increased gradually each day until they are being fed 3.5 pounds on the sixth day.

It must be kept in mind that the figures in Table V are merely approximations, and the amounts fed depend a great deal upon the reaction

of the cattle to the feed. Different cattle will react differently to the same ration, so a feeder must closely observe his cattle, especially during the first part of the feeding period. When the cattle are first put on feed, they may tend to overeat; therefore, the feeder must be careful to place in the feed troughs only the amount of feed he feels they should eat.

It was discovered during the interviews that many feeders begin to "get ahead" of the cattle after they have been on feed approximately 20 days, i.e. more grain is placed in the troughs than they will eat. This is known as self-feeding, and this method will be used during the hypothetical feeding operation. From approximately the 20th day to the end of the feeding period, the cattle will be given all of the grain and molasses combination they will consume, but the alfalfa will be limited to four pounds per day. If too much hay is fed, the cattle will tend to fill up on this and eat less of the concentrates, thereby reducing their rate of gain.

In feeding only four pounds of alfalfa during most of the feeding period, approximately 45 milligrams of carotene per day are consumed by the animal. This is somewhat in conflict with Table IV where 50 milligrams are recommended for a 900 pound animal. Thus, the cattle will be lacking about five milligrams of carotene during the last few days of their feeding period. However, as stated on page 25, cattle store carotene in their bodies and can be fed a Vitamin A deficient ration for a short period of time without adverse effect on their health, so it is

safe to assume that feeding four pounds of alfalfa during the latter part of the feeding period is sufficient.

The cattle will be supplied all the salt they wish to eat. Experiments indicate that cattle fed in drylot will consume about two thirds of a pound of salt per head per month.[1] However, some loss is involved when feeding loose salt, so about one pound of salt per head per month will be supplied.

As stated before, stilbestrol will also be included in the ration. As the animal already receives an adequate amount of protein from the grain and hay, the supplement with the lowest protein content should be used. In the Triangle Area, this is a supplement containing 20 percent protein and 10 milligrams of stilbestrol per pound. Thus, one pound per head per day of this will be supplied the cattle in the hypothetical feeding operation.

Many variations of the amounts of ration ingredients presented in this sub-section are possible, and many feeders may find success in feeding amounts other than those suggested. It is not proposed that, in feeding the prescribed amounts, the most economical gain will be achieved. However, data obtained from interviews indicate that this ration, fed in the aforementioned amounts, will normally meet the three criteria outlined at the beginning of this sub-section, resulting in a profitable feeding operation.

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[1] Morrison, F. B., op.cit., p. 783.

When to Begin Feeding

When to begin feeding is another decision which can be made only by the individual feeder. Usually, the farmer will find it most convenient to begin feeding after fall work is completed and to sell the cattle before spring work begins, because this is the period when his labor is the least valuable. The exact time the cattle are purchased within this period, however, will depend upon when the feeder can most economically buy the kind of cattle he desires. For budgeting purposes it will be assumed the cattle for the hypothetical feeding operation are purchased the first of October.

Length of Feeding Period

The decision of when to sell the fattened animal is one of the most important made by a feeder. It is within this area that some of the most costly errors are made by both the experienced and inexperienced feeder.

The decision, of course, cannot be made before the cattle are put on feed; however, an estimated length of feeding period can and should be included in the planning. The exact selling date depends on many factors, including the price of fat cattle, the variable cost of feeding, and the current rate of gain. Because so many variables are involved, it is impossible to establish a formula to use in determining the exact selling date. Each feeder must, as the feeding period progresses, predict the future price of fat cattle and the further gain to be made by

the cattle. Then he must compare the profit or loss realized if the cattle were sold now with the profit or loss to be realized in the future. To do this, the farmer must have a budget for the feeding operation and a record of actual expenses incurred to date. Without these, he cannot hope to make an intelligent choice of the optimum time to sell.

Because this general description of how to determine the most profitable selling date is somewhat vague and confusing, two examples will be presented to illustrate the use of this procedure. First, however, a daily rate of gain and a daily variable cost of feeding must be established for use in the examples. These are estimated figures for the hypothetical feeding operation and should not be construed to represent the average curves for all feeding operations. These estimates are presented below in graphic form.

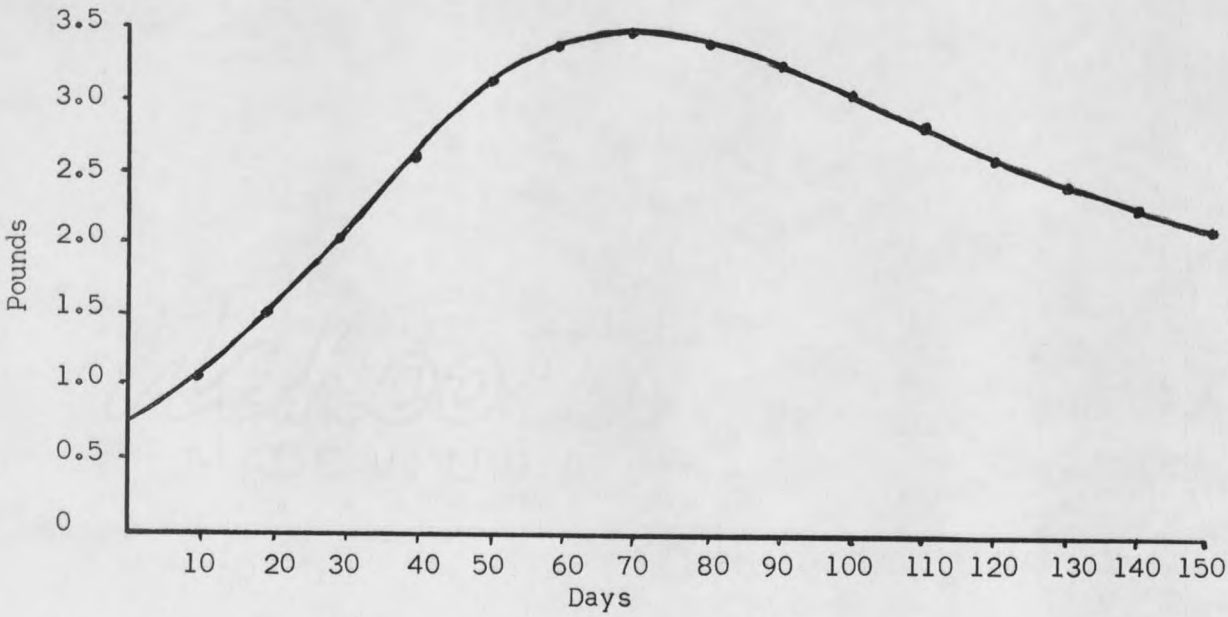

Figure 3. An Example of the Daily Rate of Gain Per Animal.

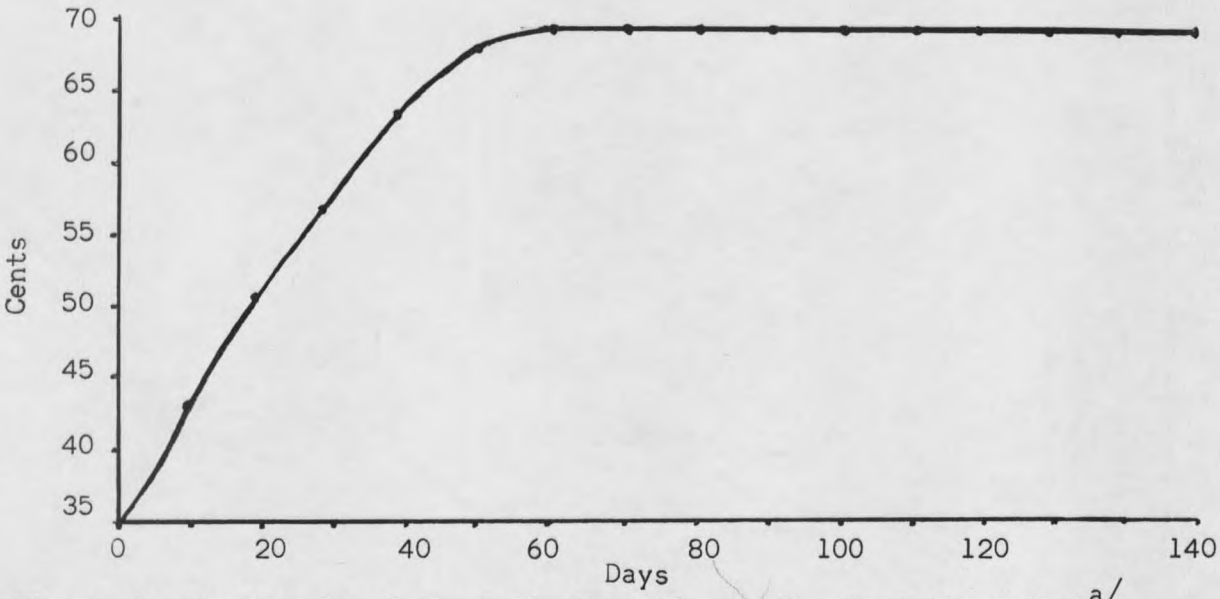

Figure 4. An Example of the Daily Variable Feeding Cost Per Animal[a/]

[a/] See Appendix B for detailed breakdown.

Using information in the preceding figures, two situations will be presented to explain the procedure for determining the optimum time to sell. Basic assumptions in both situations are that the cattle can reach a choice grade but cannot economically be fed to prime before slaughter, and that the prices of good grade and choice grade slaughter cattle, although different, are constant. (This latter assumption is unrealistic; however, a constant price will serve the purpose for which it is intended. A fluctuating price would merely complicate the examples.)

In Example No. 1, the price of good grade slaughter cattle is 28 cents per pound, and the price of choice grade is 31 cents per pound.

Also, it is assumed that the cattle will reach the choice grade at 930 pounds, which will be on the 130th day of feeding if the gain is as shown in Figure 3. Thus, the gross income per animal from each day's feeding can be obtained by multiplying the daily gain per animal by 28 cents for the first 130 days, and by 31 cents for the remainder of the feeding period. By comparing the daily gross income per animal with the daily variable cost of feeding per animal, the optimum selling date can be determined. This is presented in Figure 5 below.

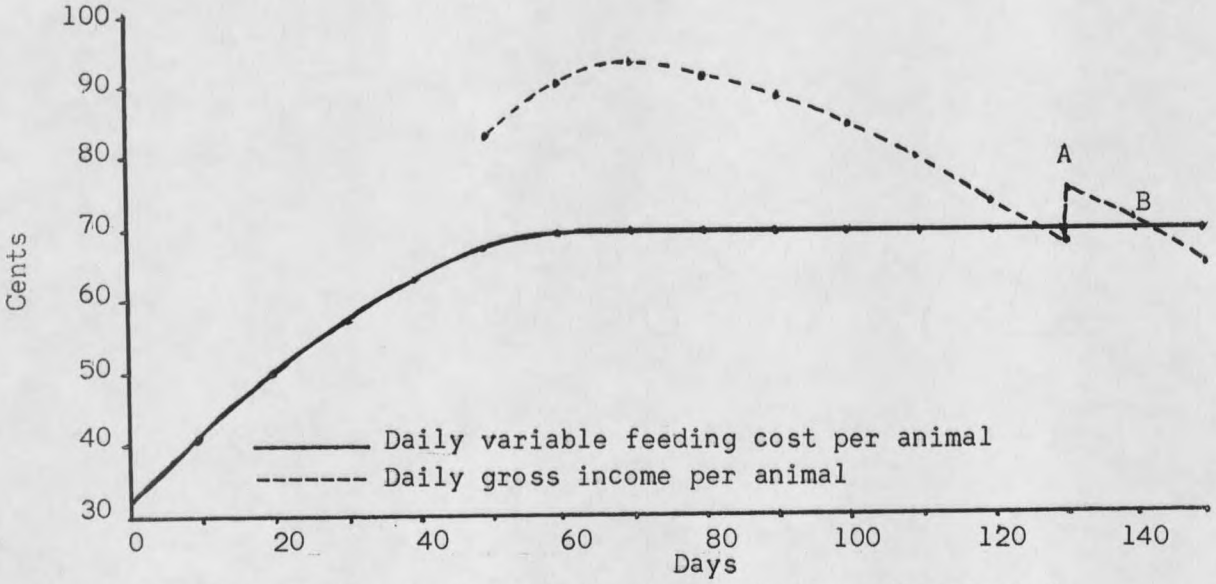

Figure 5. Example No. 1 of the Optimum Length of Feeding Period.

From this graph the conclusion can be drawn that, whenever prices are constant and the daily gross income per animal exceeds the daily variable cost of feeding per animal after the cattle reach the choice grade (point A), feeding should continue until the two become equal (point B) in order to maximize profits, or minimize losses, whichever

may be the case. If sold before this time, profits from the last few days of feeding would not be realized. If the cattle are fed after this date, the daily variable cost exceeds the daily gross income, and unnecessary losses would be incurred.

In Example No. 2, the price of good grade slaughter cattle is 22 cents per pound, and the price of choice grade is 25 cents per pound. Here again it is assumed that the cattle will reach choice at 930 pounds, which will be on the 130th day of feeding, if the gain is as shown in Figure 3. To compute the gross income per animal from each day's feeding, multiply the daily gain per animal by 22 cents for the first 130 days, and by 25 cents for the remainder of the feeding period. Then, as in Example No. 1, compare the daily gross income per animal with the daily variable cost of feeding per animal. This comparison is shown in Figure 6.

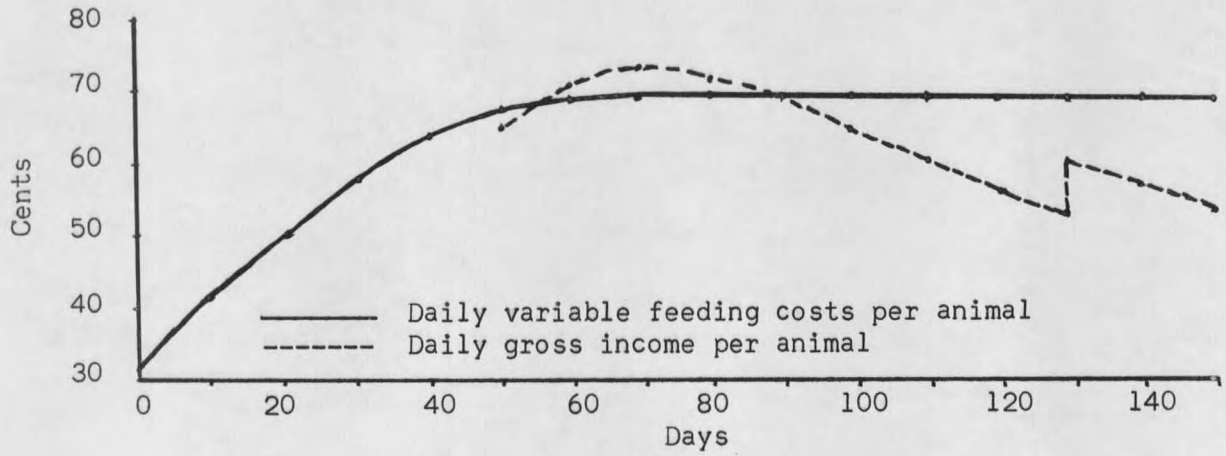

Figure 6. Example No. 2 of the Optimum Length of Feeding Period.

In a situation such as that of Figure 6, the cattle should not be sold when the daily variable feeding cost equals the daily gross income. This rule applies only when the daily gross income exceeds the daily variable cost of feeding after the animals reach the choice grade. When daily variable cost exceeds daily gross income after reaching choice, as above, the cattle should be sold immediately upon reaching choice, or on the 130th day in this instance.

The feeder may ask, "Because the feeding operation will operate at a loss when daily variable costs exceed the daily gross income, why feed at all?" This is true where there is no change in the price of the product, but this demonstrates one important exception. In this instance, the cattle sell at a higher quality which commands a price premium. Thus, the initial 600 pounds that were purchased at a price of 20 cents per pound has a selling price of 25 cents per pound, and this profit exceeds the loss of adding the 330 pounds of gain during the feeding period, resulting in a profitable feeding operation.

This rule also applies if the daily variable cost exceeds the daily gross income throughout the entire feeding period. This is shown in Figure 7, assuming the price of good grade slaughter cattle is 20 cents per pound and the price of choice grade is 23 cents per pound. Here, too, a profit may be realized due to the increase in grade and price per pound for that higher grade animal.

These examples indicate the general method for determining the optimum length of feeding period. A fluctuating price complicates its use

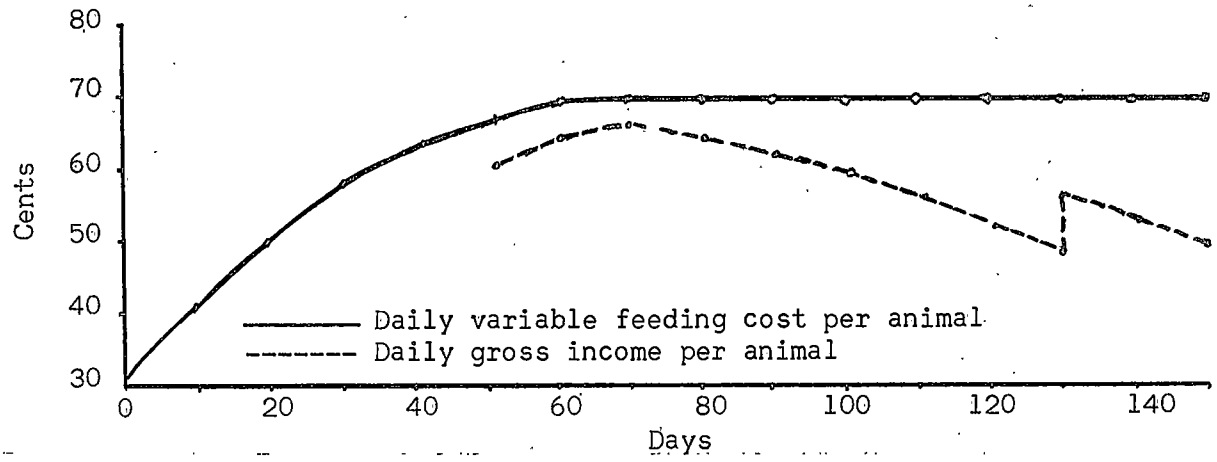

Figure 7. Example No. 3 of the Optimum Length of Feeding Period.

by placing more emphasis on chance and insight into future prices, but the basic principles remain the same. If the feeder has prepared a realistic budget and keeps adequate records on the feeding operation, this method will be relatively simple to use. Budgets and records will not dictate the exact optimum selling date because prices are variable; but without them, one can only guess at this date, thereby increasing the possibility of a severe monetary loss.

As stated before, it is essential to estimate the length of feeding period for budgeting purposes before actually deciding whether or not it will be profitable to feed. In budgeting for the hypothetical feeding operation, the rate of gain, daily variable cost, and daily gross income shown in Figures 3, 4, and 7 will be used.

Number to Feed

The correct number of cattle to feed can be determined only by each individual feeder. It is influenced by many factors, but probably the most important is the amount of money available to the prospective feeder and the capacity of his existing facilities, if any. A restriction of somewhat less importance might be the number of non-wheat producing acres remaining after acreage allotments. This, however, need not be a definite limiting factor because a farmer who finds he cannot produce enough feed grain for his planned feeding operation can usually but from a neighbor.

For this feeding operation, it will be assumed that financing is not a limiting factor and there are few existing facilities. Therefore, the amount of feed grain the hypothetical farm's 130 "extra" acres will (normally) produce will be used as the factor limiting the number of cattle to feed.

A determination must be made regarding how much grain needed to fatten an animal, and how much this 130 acres will produce. In totaling up the estimates in Table VI of the amount of grain each animal will consume, it is found that during 130 days each animal will eat approximately 105 pounds of oats and 2,050 pounds of barley. When feeding 100 cattle or less, the total amount of oats consumed would be relatively small. It will be assumed for this feeding operation that it is more economical to buy the oats than to seed and harvest so few acres of them.

For the seven-year period, 1950 through 1956, the average yield of barley per harvested non-irrigated acre in the Triangle Area was 27.1 bushels.[1] Using this figure, the hypothetical farm would normally produce 3,510 bushels of barley on its 130 acres. If each animal consumed 2,050 pounds, or approximately 43 bushels in 130 days, this amount of barley would feed about 80 animals for that length of time. As was stated before, it is impossible to determine the exact length of the feeding period before the cattle are put on feed. So, in order to insure an adequate amount of barley, only 70 cattle will be fed in this operation. Then there will be enough barley to feed these 70 head for approximately 145 days, in the event this is found to be the most economical length of feeding period.

Equipment Required

In drylot feeding an important consideration is the size of the feedlot. If it is too large, a maximum gain may not be realized because of excessive exercise, i.e. the cattle may tend to "run off" their gain. If it is too small, insufficient exercise may result in a lack of appetite. It is recommended that 100 to 200 square feet be allowed for each animal in an unpaved lot.[2] One hundred and fifty square feet per animal will be allowed for this operation.

1/ Montana Department of Agriculture, op.cit., Vol. IV, pp. 50, 51; Vol. V, pp. 26, 27; and Vol. VI, pp. 40, 41.

2/ Maynard, E. J., op.cit., p. 73.

Several different types of fences may be used to enclose the feedlot. For this feeding operation, it will be assumed that two-inch-thick planks fastened horizontally to wooden posts will be used. On one side of the feedlot a chute will be constructed for loading cattle into a truck. The ramp will be removable so the chute can also be used to hold animals for veterinary treatment.

It is extremely important to consider the slope of the ground before selecting the site for a feedlot. The ground should slope gradually to provide adequate drainage, thus keeping the feedlot as dry as possible. Also, if over 50 animals are fed, and they vary in quality a great deal or in sex, it may be wise to divide the feedlot, separating them into two different pens. This would allow the operator to feed each group a ration to which it is best suited.[1/] Because only 70 head will be fed here, and they will all be choice grade animals of the same sex, only one feedpen will be used.

Due to the severe winters in the Triangle Area, some type of shelter must be provided when feeding cattle during the winter months. This may be in the form of a windbreak or a shed. E. P. Orcutt states in Fattening Montana Cattle that feedlot sheds are not necessary in the Triangle Area as a general rule, except, perhaps, when feeding calves. Because yearlings will be fed on the hypothetical farm, only a windbreak will be used. It will be a solid one inch thick board panel extending

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1/ Orcutt, E. P., Fattening Montana Cattle, op.cit., p. 27.

from the top of the fence to eight feet above the ground[1] on the north and west sides of the feedlot, as these are the directions of the prevailing winds in the Triangle Area.[2]

Grain troughs and hay mangers are needed, and it is recommended that two and one-half linear feet per head of trough space and a similar length at the hay mangers be allowed.[3] The hay mangers will be along the south and east sides of the feedlot to facilitate unloading of hay from a truck by driving on the outside of the fence. The grain troughs will be located in the center of the feedlot on each side of a grain storage area. This area will have a cement floor on which the grain will be piled and a roof for weather protection. Siding extending down from the roof to approximately two feet above the feed troughs will partially enclose the area. One end will be completely enclosed, and large doors will be constructed on the other end, allowing a truck to back in for unloading. Only grain that has been prepared for feeding will be stored in this area.

A large box is also needed for salt and bone meal. To minimize the chance of contamination from the animals' excreta, this box should be

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1/ Black, W. H., Feedlot and Ranch Equipment for Beef Cattle, United States Department of Agriculture, Farmers' Bulletin No. 1584, Washington, D. C., May, 1940, p. 4.

2/ For a detailed discussion of feedlot sheds see the South Dakota Agricultural Experiment Station's Beef Cattle Housing in the North Central Region of the United States, South Dakota State College, Bulletin No. 382, Brookings, South Dakota, June, 1946, pp. 5-19; and Black, W. H., op.cit., pp. 1-3.

3/ Maynard, E. J., op.cit., p. 73.

placed on a stand or attached to a building. It may also have a small roof-type cover above it to protect the contents from rain and snow.

It is very important that cattle on feed be supplied all the clean water they will drink. A minimum of 10 gallons per head daily should be available,[1] and it will be assumed that the hypothetical farm has a well and pump which will supply this amount. If the pump will supply a large amount of water in a relatively short period of time, only a small water tank is needed. A rectangular, oval-end tank, 10 feet by two feet by two feet, with a capacity of approximately 300 gallons will be used for this feeding operation.

A water heater should also be used in cold weather. Not only is it necessary to keep the water temperature above freezing, but it should be heated to remove the chill. If it is not, the animal must use high-priced feed as fuel to heat the water and this proves too costly.[2] A small oil heater will be used for the hypothetical feeding operation.

Another feedlot installation which is considered a necessity by many feeders is a set of cattle scales. The following example is used to illustrate the importance of scales in a feedlot operation.

Suppose 70 head of cattle are on feed and they can be sold currently as choice for 24 cents per pound liveweight. If they are fed for three more weeks, it is expected that they can still be sold as choice for 24 cents per pound. If it is costing 66 cents per day to feed

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1/ Morrison, F. B., op.cit., p. 789.

2/ Orcutt, E. P., Fattening Montana Cattle, op.cit., p. 35.

each animal, should they be sold now or fed for three more weeks? Are they gaining enough to more than offset the feeding costs? Without scales, few, if any, feeders can intelligently answer this question--they can only guess.

If the average gain is 2.75 pounds per head per day, the daily income per animal (2.75 x $.24 = $.66) exactly equals the daily feeding costs, so the animals should be sold immediately. Now, suppose the feeder estimates the daily gain at 2.80 pounds, but actually, they are only gaining 2.00 pounds per day. If feeding costs and daily gain remain the same, he would lose $3.78 per animal or a total of $264.60 by feeding three weeks longer. This is a substantial loss, and yet the error in judgment depicted in this example is very small compared to many of those actually made by feeders. Suppose the cattle were only gaining one pound per head per day. If feeding costs and daily gain remain unchanged, $617.40 would be lost by feeding 70 head an additional three weeks.

Thus, a feeder must not only know his feeding costs, but he must also know how fast his cattle are gaining in order to determine the correct time to sell. A feeder can only know how fast his cattle are gaining by weighing them periodically. If feeding is carried on over an extended period of time, the money saved through elimination of erroneous guessing would more than compensate for the cost of the scales. Therefore, scales will be used on the hypothetical farm, and they will be located adjacent to the chute for easy handling of the cattle when they

are to be weighed. The scales will be large enough (nine feet by 18 feet) and located in such a manner that a truck may also be weighed on them to facilitate correct measurement of the amount of feed consumed during a predetermined interval.

The stationary equipment for the feedlot has now been described. Below is one of a great number of plans for a feedlot design (see Figure 8) that is to be the type used in this feeding operation. It is not proposed, however, that this is the best feedlot design; only a convenient one for this operation. It is recommended that each farmer choose the design which is best suited to his particular feeding operation.

Previously it was mentioned that neither barley nor oats should be fed whole to yearlings; thus it must be ground or rolled. Insufficient data exist to compare properly the value of ground grain with that having been rolled, so the choice is left to the decision of the farmer. Rolled grain will be used in this feeding operation because nearly all farmers interviewed used it.

There is also the choice between steam and dry rolling. Again there is insufficient data to make a reliable comparison between the two methods, so they will be considered as equal in value.

If a farmer plans to feed each winter, it will usually be profitable for him to buy his own rolling mill. For example, the prevailing charge for rolling grain in the Triangle Area was 15 cents per hundredweight. According to previous feed estimates, a total of approximately 174,020

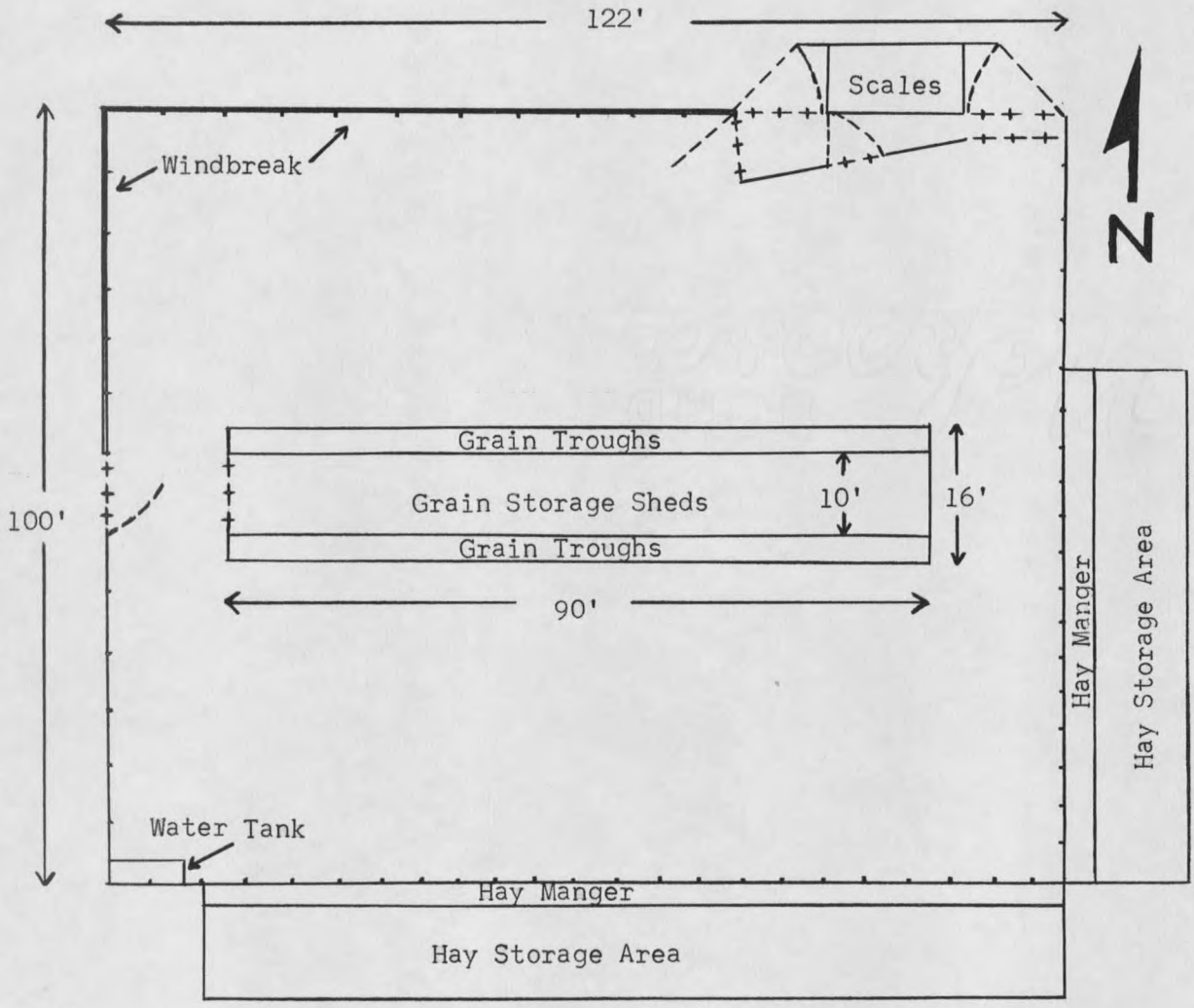

Figure 8. Feedlot Design for Hypothetical Feeding Operation.

pounds of barley, oats, and molasses will be consumed in this feeding operation. The cost of getting this rolled would be about $261.00, excluding the cost of transportation to and from town. A dry rolling

mill can be purchased for approximately $550.00. Little doubt remains that it would be wise for a farmer to purchase his own rolling mill, so one will be bought for use in the hypothetical feeding operation.

A truck will be needed to haul grain and hay; however, it will be assumed that the hypothetical farm already has a truck. Also a tractor and manure loader attachment are necessary to clean the feedlot of manure and dirty bedding. Again it is reasonable to assume that the typical wheat farm has a tractor, but probably not a loader. Therefore, one must be purchased for the feeding operation.

Bins are needed to store the grain which will be fed to the cattle. However, most wheat farms will have enough existing bins to store the amount of grain needed for the feeding operation, so additional bins will not be necessary.

The areas where choices must be made by a prospective feeder before a budget can be prepared have now been discussed. The decisions made within these areas are extremely important, for they are the foundation upon which a feeder makes the final decision of whether or not to feed. If these choices are made in haste without a thorough study of the influencing factors involved, only good fortune can produce a profitable feeding enterprise; and good fortune cannot be relied upon.

PART IV

BUDGET FOR A FEEDING OPERATION

Using the choices made in Part III, a budget can now be prepared for the hypothetical feeding operation. First, however, several decisions must be made to provide a basis from which the budget will be prepared.

Budget Decisions

Remuneration for the operator's labor will not be included in the expenses because it is assumed he has no other income-producing alternatives.

Interest on the amount of investment will be 6 percent, and straight-line depreciation will be used over the estimated life of the item. Depreciation and interest on the truck, tractor, and grain bins will not be charged to this operation because they are primarily used in the normal operation of a wheat farm. All other equipment and facilities, including the manure loader attachment for the tractor, will be charged to the feeding enterprise at the aforementioned rates.

It is assumed the farmer uses only his own labor to feed the cattle and build the chute, feed pen, grain troughs, hay mangers, and all of the grain storage shed except the concrete floor. The cost of pouring the concrete floor, digging the scale pit, and installing the scales will be included in the expenses.

Twenty cents per pound will be paid for the cattle and this will include delivery to the farm. Assuming the selling price will exclude delivery, transportation of the cattle is not the farmer's responsibility, so no stockrack is needed for the truck.

The Budget

Cost estimates used in the budget below will be either from (1) information obtained from secondary sources, (2) quotations from business firms, or (3) interviews with feeders.

Expenses:

Cattle, 70 head x 600 lbs. x $.20		$8,400.00
Feed -		
Barley[a] 2990 bu. @ $1.11/bu.	$3,318.90	
Oats[a] 230 bu. @ $.72/bu.	165.60	
Molasses 331 lbs. @ $4.00/cwt.	13.24	
Alfalfa 26 tons @ $25.00/ton	650.00	
Stilbestrol 9100 lbs. @ $85.00/ton	386.75	
Salt 300 lbs. @ $2.10/cwt.	6.30	4,540.79
Death Loss[b] .21% of $8,400.00		17.64
Miscellaneous[c] $.26 per 100# gain		60.06
Operating -		
Tank Heater 1300 hrs. @ $.01/hr.	13.00	
Truck 440 mi. @ $.08/mi.	35.20	
Tractor 50 hrs. @ $1.00/hr.	50.00	98.20
Interest		
Feedpen, Shed, Equipment[d] - $6265.00 @ 6% for one year	375.90	
Feed[e] $4541.00 @ 6% for 130 days	98.39	
Cattle $8400 @ 6% for 130 days	182.00	
Operating costs[f] $99 @ 6% for 65 days	1.07	657.36
Depreciation[g]		
Fence, Windbreak, Chute, Hay Mangers	36.98	
Grain Troughs	25.50	
Grain Shed	46.17	
Salt Box	.50	
Scales	178.83	
Water Tank	4.20	

Depreciation (continued)		
Water Heater	5.80	
Rolling Mill	55.00	
Manure Loader	32.00	
Paint	65.07	450.05
Total Expenses		$14,224.10

a/ National average support prices for barley and oats for 1950 through 1956, Agricultural Marketing Service, The Feed Situation, Washington, D. C., July 30, 1956, p. 18.

b/ Department of Agricultural Economics, Nineteenth Annual Report of Feeder Cattle, University of Illinois, Urbana, Illinois, December, 1957, p. 18.

c/ Includes veterinary expenses, trips to purchase cattle, etc., Mueller, A. G., and Henry, B. A., Detailed Cost Report for Northern Illinois, University of Illinois, Urbana, Illinois, March, 1958, p. 24.

d/ See Appendix C for detailed breakdown of total cost of feedpen, shed, and equipment.

e/ Amount of investment estimated assuming all feed was purchased (or could have been sold) prior to beginning of the feeding operation.

f/ Assuming equal expenses for each day of feeding, interest was figured for only one half of the feeding period.

g/ See Appendix D for calculation of depreciation.

The total annual expenses for the feeding operation, including the purchase price of the cattle, are estimated to be $14,224.10, or $203.20 per animal. According to Figure 3 and Appendix A, if the cattle are sold on the 130th day of feeding as planned, they have gained 332.5 pounds per head; thus averaging 932.5 pounds when sold. By dividing $203.20 by 932.5, it is found that the cattle must be sold for 21.8 cents (or a margin of 1.8 cents) per pound to break even financially.

The necessary planning involved in making the decision of whether or not to feed has now been illustrated--except for one step. Now that the feeder knows what the selling price must be to break even financially, he must predict the future price of slaughter cattle. This is the most difficult aspect of all the planning, for the information on which to base this prediction is scant. Studying the past and present cattle markets will be a great help, yet much depends upon chance. Possibly the most practical solution is to feed year after year, and if the farmer competes favorably with other feeders, he will show a profit in the long run. And he who intelligently budgets for his feeding operation will compete favorably where that possibility exists.

PART V

CONCLUSION

The purpose of this thesis is to provide a guide which dryland wheat farmers may use in determining the profitability of fattening cattle during the winter months as a supplementary enterprise. The guide is specifically for the use of farmers in the Triangle Area of Montana, as it is intended that the hypothetical feeding operation be somewhat typical of a feeding operation in this area. It is not, however, intended that the farmer copy his fattening operation after the one illustrated here.

It is conceivable that a farmer may need only a one cent margin or less to make profit if he buys his feed and equipment wisely, or if he has much of the required equipment already on hand. Also, a ration superior to the one used here may be found by the farmer to further reduce costs. This should be used only as a guide in illustrating the basic decisions that must be made and the budget outline that may be followed.

This information will be most helpful to the beginning feeder, but it does not embrace all aspects of feeding. A beginning feeder should also talk with experienced feeders in his locality, send for information on feeding from the State Experiment Station, and take any other steps necessary to gain more knowledge of the feeding business.

Having gained as much information as is necessary properly to conduct a feeding operation, the feeder can then proceed to plan for the

various items of expense shown in the budget of the hypothetical feedlot operation that was described in Part IV.

Following the steps enumerated above will permit an individual to proceed in an orderly manner which makes him take account of a number of important items that might otherwise be ignored.

It is sincerely hoped that this thesis will convince the beginning feeder (and possibly others who have no formal plan of their operation) of the need for planning and that it can serve as a useful tool for him and his more progressive contemporaries who already realize that profits and business planning are inseparable.

APPENDIX

APPENDIX A. RATE OF GAIN PER ANIMAL

Day of Feeding Period	Daily Gain	Difference in Gain	Average for Ten Day Period	Average Gain for Ten Day Period	Cumulative Total Gain
0	.75				
		.30	.900	9.00	
10th	1.05				9.00
		.40	1.250	12.50	
20th	1.45				21.50
		.50	1.700	17.00	
30th	1.95				38.50
		.60	2.250	22.50	
40th	2.55				61.00
		.45	2.775	27.75	
50th	3.00				88.75
		.25	3.125	31.25	
60th	3.25				120.00
		.10	3.300	33.00	
70th	3.35				153.00
		-.05	3.325	33.25	
80th	3.30				186.25
		-.10	3.250	32.50	
90th	3.20				218.75
		-.15	3.125	31.25	
100th	3.05				250.00
		-.20	2.950	24.50	
110th	2.85				279.50
		-.20	2.750	27.50	
120th	2.65				307.00
		-.20	2.550	25.50	
130th	2.45				332.50
		-.15	2.375	23.75	
140th	2.30				356.25
		-.15	2.225	22.25	
150th	2.15				378.50

APPENDIX B. VARIABLE FEEDING COST PER ANIMAL.

Item of Expense	Cost of Specified Day						
	1st	11th	21st	31st	41st	51st	61st-150th
Feed[a]							
Barley[b]	$.0347	$.0809	$.1686	$.3465	$.4158	$.4389	$.4620
Oats[c]	.0337	.0787	.0833	---	---	---	---
Molasses[d]	.0120	.0280	.0660	.0900	.1080	.1140	.1200
Alfalfa[e]	.2125	.1625	.1125	.0625	.0500	.0500	.0500
Stilbestrol[f]	.0425	.0425	.0425	.0425	.0425	.0425	.0425
Salt[g]	.0007	.0007	.0007	.0007	.0007	.0007	.0007
Operating Exp.[h]	.0070	.0070	.0070	.0070	.0070	.0070	.0070
Interest[i]	.0217	.0217	.0217	.0217	.0217	.0217	.0217
Total	$.3648	$.4220	$.5023	$.5709	$.6457	$.6748	$.7039

[a] See Table VI for amount of ingredient fed.

[b] Figured at $1.11 per bushel or $.0231 per pound.

[c] Figured at $.72 per bushel or $.0225 per pound.

[d] Figured at $4.00 per cwt. or $.04 per pound.

[e] Figured at $25.00 per ton or $.0125 per pound.

[f] Figured at $85.00 per ton or $.0425 per pound.

[g] Figured at $2.10 per cwt. or $.0210 per pound.

[h] Figured straight-line on all expenses for tractor and tank heater, but only on 15 miles for truck. For further information refer to Part IV, The Budget.

[i] Figured at 6 percent on investment in cattle only.

APPENDIX C. COST OF EQUIPMENT AND FACILITIES.

Fence, Windbreak, Chute, Hay Mangers:		
Posts: 7' x 4-5" 47 posts @ $1.30/post	$ 61.10	
8' x 4-5" 11 posts @ $1.40/post	15.40	
10' x 4-6" 17 posts @ $1.60/post	27.20	
Paneling: 1 x 10 (#2 & 3) 938 bd. ft. @ $130/1000	121.94	
2 x 4 (#2 & 3) 68 bd. ft. @ $130/1000	8.84	
2 x 6 (#2 & 3) 964 bd. ft @ $130/1000	125.32	
Nails	10.00	
Total		$ 369.80
Grain Troughs:		
2 x 4 (#2 & 3) 206 bd. ft. @ $130/1000	$ 26.78	
2 x 6 (#2 & 3) 500 bd. ft. @ $130/1000	65.00	
2 x 12 (#1) 1080 bd. ft. @ $170/1000	183.60	
4 x 4 (#1) 216 bd. ft. @ $170/1000	36.72	
Bolts (5½" x 5/8") 352 @ $.20 ea.	70.40	
Total		$ 382.50
Grain Shed:		
1 x 8 (Utility) 1104 bd. ft. @ $90/1000	$ 99.36	
1 x 10 (#2 & 3) 976 bd. ft. @ $130/1000	126.88	
2 x 4 (#2 & 3) 337 bd. ft. @ $130/1000	43.81	
4 x 4 (#1) 214 bd. ft. @ $170/1000	36.38	
Shingles (#167 Asphalt) & Roof Edge 1104 sq. ft.	99.00	
Felt 1104 sq. ft.	12.00	
Concrete 17 cu. yds. @ $15/cu. yd.	255.00	
Nails	20.00	
Total		$ 692.43
Salt Box:		
2 x 6 (#2 & 3) 19 bd. ft. @ $130/1000	$ 2.47	
Total		2.47
Scales:		
Frame	$1,236.50	
Rack: Metal	270.50	
Lumber: 2 x 6 (#2 & 3) 252 bd. ft. @ $130/1000	32.76	
2 x 12 (#1) 216 bd. ft. @ $170/1000	36.72	
Pit, Concrete & Installation	2,000.00	
Total		$3,576.48

APPENDIX C. COST OF EQUIPMENT AND FACILITIES (Continued).

Water Tank, 2' x 2' x 10'	$ 42.00
Tank Heater	$ 29.00
Rolling Mill	$ 550.00
Manure Loader	$ 320.00
Paint: (Two Coats) 42 gals. @ $7.15/gal.	$ 300.30
Grand Total Cost	$6,264,98

APPENDIX D. DEPRECIATION SCHEDULE

Item	Total Cost	Estimated Life	Cost Per Year
Fence, Windbreak, Chute, Hay Mangers	$ 369.80	10 yrs.	$ 36.98
Grain Troughs	382.50	15 yrs.	25.50
Grain Shed	692.43	15 yrs.	46.17
Salt Box	2.47	5 yrs.	.50
Scales	3,576.48	20 yrs.	178.83
Water Tank	42.00	10 yrs.	4.20
Water Heater	29.00	5 yrs.	5.80
Rolling Mill	550.00	10 yrs.	55.00
Manure Loader	320.00	10 yrs.	32.00
Paint	300.30	3 yrs.[a]	65.07

[a] One coat of paint is applied every three years; thus, for the cost per year, the life of the first coat is estimated at 10 years and the second coat at three years.

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