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.

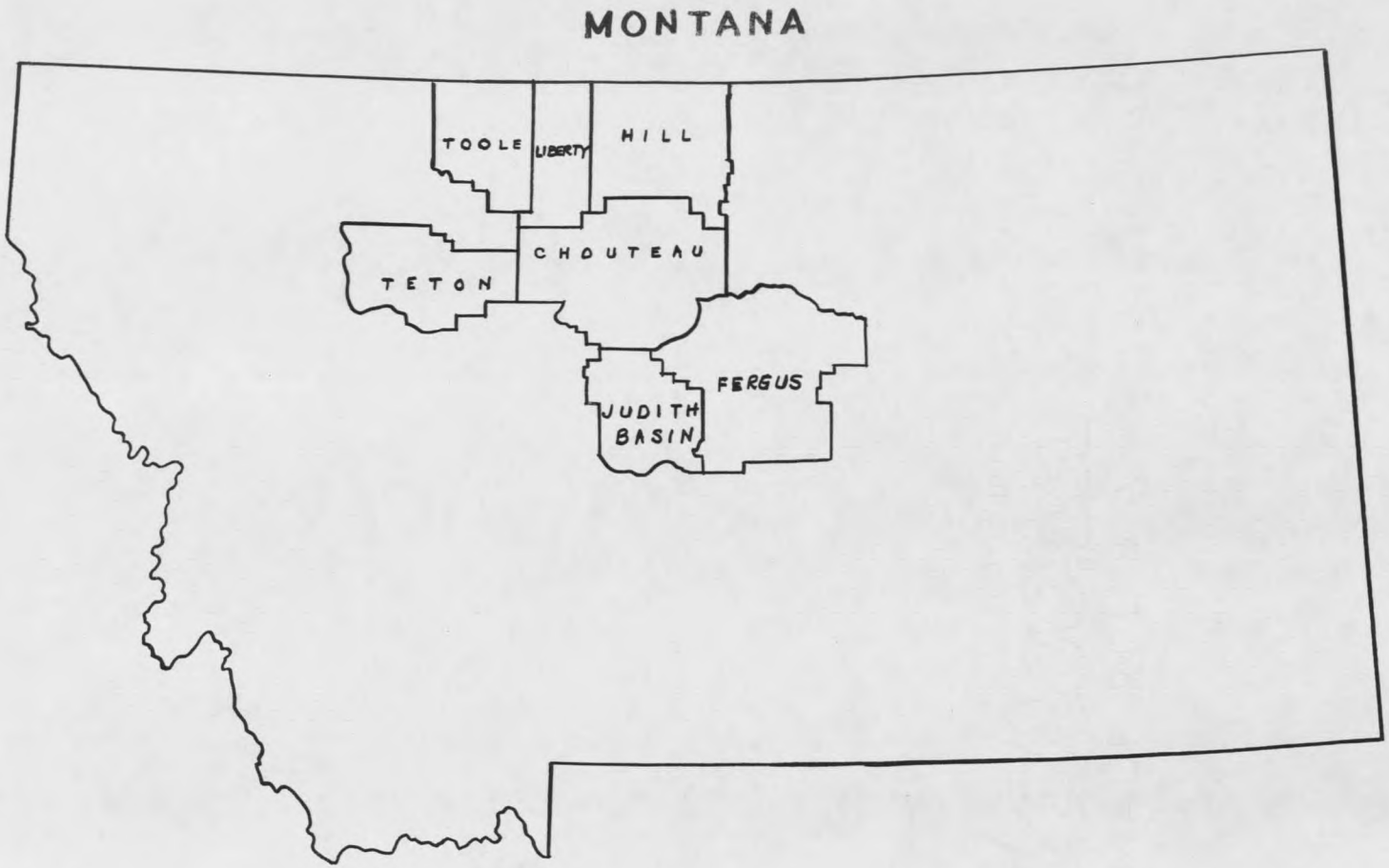

Figure 1. Map of Montana Illustrating the Triangle Area

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).

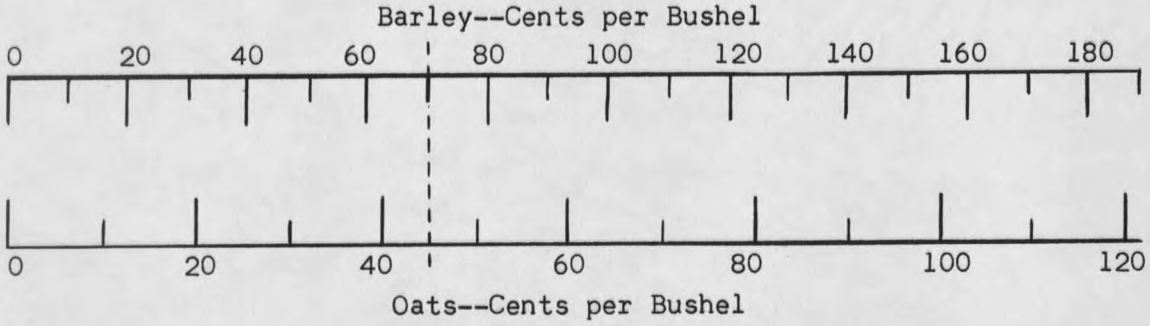

Figure 2. Scale of Prices of Barley and Oats and Their Relative Values for Fattening Beef Cattle.a/

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.