



Factors contributing to the success or failure of Montana ranches
by John G Nye

A THESIS Submitted to the Graduate Committee in partial fulfillment of the requirement for the degree of Master of science in animal husbandry with a minor in agricultural economics
Montana State University
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Abstract:

The purpose of this study is to determine so accurately as possible the extent to which the various controllable, as well as uncontrollable, factors are responsible for the success or failure of Montana ranches. An attempt has been made to analyze operating costs and income as they affect ranch operations and management practices, and to indicate the practices which have proved most successful. This thesis was developed from secondary source material such as Agricultural experiment Station bulletins and additional data which are to be found in the files of the Department of agricultural Economics at Montana state college.

A careful study of the material at hand would seem to indicate that the most important factors which influence the success of Montana ranches are: 1. A definite long-time plan of operations for each Individual unit based upon the adaptability of the plant, and the type of production, as they are related to the physical environment.

2. Management and the ability of the operator to obtain: high calf and lamb crops, high yields per acre of farm crops for supplementary feed, high quality in his produce, and advantageous prices for his commodities.

3. Keeping a complete and accurate set of records, and planning a definite budget of expenses and Income.

4. Death loss in livestock must be held to a minimum.

5. The general price level of agricultural commodities, more particularly as compared with that of other commodities, is of importance. The writer has placed this factor last in the group of factors determining the financial outcome of Montana ranch operations, largely because it is less subject to the control of the operator.

It appears to the writer that the factors contributing to the success or failure of ranch operations rank in importance in the order named. It is essential that the operator give some attention to all of these factors if his ranching operations are to be successful.

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TABLE OF CONTENTS

	<u>Page</u>
List of Tables and Illustrations	3
Abstract	4
Part I. Introduction and Historical Review	5
A. Early History of the Development of the Range Industry in Montana	6
Part II. Physical and Technical Factors Contributing to Success	10
A. Physical Characteristics of Montana	10
B. Types of Production	11
C. Breeding Practices	14
Part III. Economic Factors Contributing to Success	17
A. Land Utilization and Ecological Factors	17
B. Land Charge	18
C. Land Policy and the Farm Program	21
D. The Need for Sound and Adequate Credit Facilities	22
E. Range Cattle Production Practices	25
F. Range Sheep Production Practices	44
Part IV. Summary and Conclusions	57
Acknowledgments	63
Review of Literature	64

TABLES AND ILLUSTRATIONS

	<u>Page</u>
Table I, Cost Items per Animal Unit for Montana Ranches, 1929 and 1933	29
Table II, Operating Costs per Animal Unit by Regions, 1929 to 1933	29
Table III, Costs and Weights for Different Ages of Cattle Marketed, 1929-1933	33
Table IV, Five-year Average Selling Price per Hundredweight at Ranch to Cover Costs Plus Interest at 6 Per Cent	34
Table V, The Averages and Variations in the Number of Cattle Units Run per Man Year of Labor Time During the Five-year Period	35
Table VI, Range and Hay Land Used and Leased, 1929-1933	37
Table VII, Grazing Costs on Individual Ranches	38
Table VIII, Use of Winter Feeds and Range Supplements	41
Table IX, Hay Costs on Individual Ranches (average 1929-1933)	42
Table X, The Average Relationship of the Various Per Head Cost Items of All Ranches Studied in the Two Areas at the Beginning and Close of the Study	48
Table XI, Average Operating Costs per Head by Regions, 1928-1933	49
Table XII, Average Investment Costs per Head	51
Table XIII, Average Ranch Organization	51
Table XIV, Size of Ranches by Regions in 1928	52
Table XV, Average of Factors Affecting Income for the 1928-1932 Period	52
Table XVI, Average of Factors in Operation Costs for the Two Regions, 1928-1932	53
Table XVII, Prices Paid to Farmers for Lamb and Wool and Index of Lamb and Wool Prices Combined in Montana, 1910-1936	56
Fig. 1, Showing the Three Major Regions of Range Beef Cattle Production in Montana	13
Fig. 2, Showing the two Major Regions of Range Sheep Production in Montana	15

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The purpose of this study is to determine as accurately as possible the extent to which the various controllable, as well as uncontrollable, factors are responsible for the success or failure of Montana ranches. An attempt has been made to analyze operating costs and income as they affect ranch operations and management practices, and to indicate the practices which have proved most successful.

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FACTORS CONTRIBUTING TO THE SUCCESS OR FAILURE OF
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Part I

INTRODUCTION AND HISTORICAL REVIEW

This thesis is primarily concerned with determining the factors which are most effective in influencing the success, or failure, of Montana ranches. Emphasis is placed upon an analysis of physical and economic forces which bear upon type and extent of operations practiced.

The data presented have been assembled from secondary sources. These are mostly published material of the Department of Agricultural Economics at Montana State College. Supplemental information was obtained from publications of the United States Department of Agriculture and the Production Credit Association.

There are five distinct periods in the development of agriculture within the State: First, the period of range cattle operations from the middle of the last century to 1910; second, the homestead era, pre-war and war-time period from 1910 to 1920 (30), marked by rapid expansion of dry land farming which was influenced by favorable moisture conditions and high prices; third, the readjustment period after the war from 1920 to 1925, during which time prices and moisture conditions dropped to a more normal level, reducing the number of farms and resulting in readjustment of farm values; fourth, the period from 1925 to 1932, characterized by increased technological improvements and mechanized dry-land farming which resulted in increased cultivated acreage per farm (30); fifth, the period from 1932 to the present

time during which an attempt is being made to plan agricultural operations and production on a long-time basis, emphasizing best use of the land and conservation of resources.

Early History of the Development of the Range
Industry in Montana

The development of Montana as a range territory began about the middle of the last century, or about the same time as her mining activities. In fact, the first important outlet for Montana's beef was to the miners. It was not, however, until about 1870 that the industry began to assume large proportions. At that time (1870), the Territory of Montana had 35,400 head of cattle of which approximately one-third was classified as dairy cattle and the other two-thirds as beef cattle (7).

In the early years of the industry, long-horned steers from Texas were trailed north to Montana, fattened on the range and then moved east to the market. Later, breeding stock from the southwest was brought into the state and by 1885 the total cattle numbers had reached 638,000 (7), indicating the rapidity of growth of Montana's beef cattle industry.

During the late seventies, cattle ranching became exceedingly popular and huge cattle companies were formed. These were financed by Eastern and European capital and the romantic, adventurous life of the "cowboy" became a stronger lure than had been that of the gold diggers in 1849. According to Hultz (9a), cattle were purchased sight unseen and on the "book-count" of the seller, which assumed no death loss and 100 per cent calf crop from the cows turned on the range.

Favorable moisture conditions made excellent pasture and the exceedingly mild winters experienced at that time enabled the stockmen to run their stock on the range the year round without the use of supplemental feed.

The very factors which made Montana an important range cattle producing state caused drastic losses in 1886. The unusually favorable conditions under which the range cattle industry had developed in the state led to undue optimism on the part of the cattlemen. By 1886, the herds had increased in many places to the point where grazing was barely sufficient for summer needs and the cattle went into the winter with an inadequate supply of feed. The severe winter of 1886-1887 caused terrific losses; hundreds of cattlemen were bankrupt when the winter was over, and the industry was badly crippled for nearly twenty years (27).

The drastic lesson of the winter of 1886-1887 did much to bring about changes in the slipshod methods of cattle ranching. The need for an adequate supply of winter feed, and increased control of range, both of which could best be effected on more moderate-sized, well-regulated ranches, became recognized. There followed a gradual break-up of the big outfits in favor of smaller concerns, with an increased tendency among ranchers toward controlling more of their range through land ownership and lease rather than to continue almost 100 per cent operation on Public Domain such as had been practiced previously.

The Government began an educational program, after the disastrous losses suffered during this period, to discourage over-grazing on the Public

Domain land. Ranchers saw the necessity of growing more feed and hay to tide them over the severe winter months.

The increasing demand for early-maturing, rapidly-growing cattle with more pronounced beef qualities led to the use of bulls of improved breeding on the long-horned cows. The first beef bulls to be used by Montana ranchers were mostly Shorthorns. These were gradually replaced by Herefords until at the present time the Hereford is popular almost to the total exclusion of Shorthorns for use in range beef production in Montana.

The practices indicated above showed direct results within a comparatively few years. The type of the cattle was much improved, winter losses were materially reduced, the ranges were in the process of improving rather than deteriorating, and the area was actually carrying more cattle than it had been able to do previously.

Saunderson(22) reported that there were something less than 500,000 sheep (shown in animal units*) in 1890. These increased to an all high in 1901 when wethers were matured for wool production. Following a sharp decline in the years 1901-1902, numbers of sheep remained quite uniform until 1910, returning in 1912 to the point reached two years previous. Other high points were reached in 1930, remaining at a level through 1931 and 1934, after which a steady decline took place which continued through 1938.

*An animal unit is considered as equalling one cow, one horse, 4½ head of sheep, or 3 head of hogs. The range cow weighing about 1000 pounds is taken as the unit, yearlings equal two-thirds of a unit, two-year-olds .85 of a unit, three-year-old steer, one unit, bulls, 1.3 units. These represent the approximate relationships of different classes of cattle in their range and feed requirements.

After the decline in livestock in the late eighties and early nineties, a steady increase in total animal units of livestock took place in the state, with high points in 1901, 1919 and 1934 according to Saunderson (22).

Part II

PHYSICAL AND TECHNICAL FACTORS CONTRIBUTING
TO SUCCESS

Physical Characteristics of Montana

Physical factors are of primary importance in determining the type and extent of production of the farming or ranching unit. Topography, elevation, soil, amount (as well as distribution and kind) of precipitation, duration of snow cover, available water supply, and wind velocity vary widely even for more or less localized areas of the state. It is necessary that these factors be appraised and carefully analyzed before an attempt is made to organize an operating unit. When these physical factors are understood, the operator must organize his plant and plan his operations in harmony with them if he hopes to be successful.

The physical factors mentioned above are largely responsible for the ecological aspect of the native forage on our range lands. According to Black (2) wheatgrass and grama dominate the native vegetation in the range. Buffalo grass has limited distribution in Montana but, where present, may be used in controlling run-off and erosion on well-drained sloping land (24). Buffalo grass ranks high for grazing purposes and, although it is a rather low producer, it is highly regarded as a nutritious and exceedingly palatable pasture grass (2), excellent for summer and cured winter pasturage. Grama is often mistaken for buffalo grass (24) and resembles it somewhat in growth characteristics. Other grasses which are of greater or lesser importance in various more or less localized areas of the state are plains bluegrass (*Poa arida*), cheatgrass (*Bromus tectorum*) and the needle grasses, especially

needle and thread (*Stipa comata*) (35). There are also numerous flowering plants, annual weeds, and shrubs which have increased considerably on mismanaged and drought stricken areas (15). Mismanagement, augmented by drought, has been an important factor in decreased carrying capacity of range lands in Montana (6)(36).

According to Johnson and Saunderson (11), the major uses of land resources in 1934 were; Public Domain, 5,878,931 acres, National Forests, 18,890,266 acres, Indian Reservations, 5,847,318 acres, State lands, 5,256,534 acres, County lands, 2,526,349 acres, and land in farms, 44,659,152 acres (crop land, pasture land, woodland, and other land in farms). Considerable use is made of National Forests and Indian Reservations for grazing purposes, especially during the summer months. In addition, considerable farming is done in some areas on the Indian Reservations.

Types of Production

Livestock production is of outstanding importance as regards gross agricultural income of the state (this varied from 50 per cent in 1928 to 76 per cent in 1931, and was almost equally divided between cattle and sheep enterprises of the state during this period) (11). Dairy cattle, swine and poultry are of minor importance in the state and are not likely to increase materially in this respect in the future due to the fact that this type of production is suited to the irrigated areas and smaller farm units. The distance from large centers of consumption and relatively small local demand are factors which are not conducive to any decided increase in the importance of this type of production, at least under present conditions. These livestock enterprises have developed to supply the state needs and not, generally speaking, for export.

The major portion of Montana's beef cattle and sheep are raised under range conditions and are found on ranches where their production is, in most cases, the only production enterprise of the operator. There are some combination crop and livestock ranches in certain areas, in which cases cattle seem to be more satisfactory than sheep (11).

The continued impact of the physical environment, with moisture the chief limiting factor, is gradually compelling readjustment to proper land use. Irrigation farming should eventually prove complementary to the dry farming and range livestock industries. This would insure greater stability in production of livestock and crops and make the state's agricultural program more permanent (28).

For analysis of range cattle producing units, the state has been divided into three major regions (See Fig. 1). The grouping is based upon differences in the topography, climate, native vegetation and other physical factors, and the effect of these upon ranch management and organization.

The western region has an elevation ranging between 3,000 and 7,000 feet with the cattle ranches located principally in the high mountain valleys. In this area, hay must usually be fed continuously for from three to five months. Approximately 45 per cent of the surface area is in National Forests (23).

The foothill region is one of low mountain ranges, foothills, and level or rolling benchlands and basins. It is the highest grade farm and range land in the state. Dry farming is successfully carried on in some sections of this region. Cattle ranches are generally located around and in the rough land and secondary mountain areas (23).

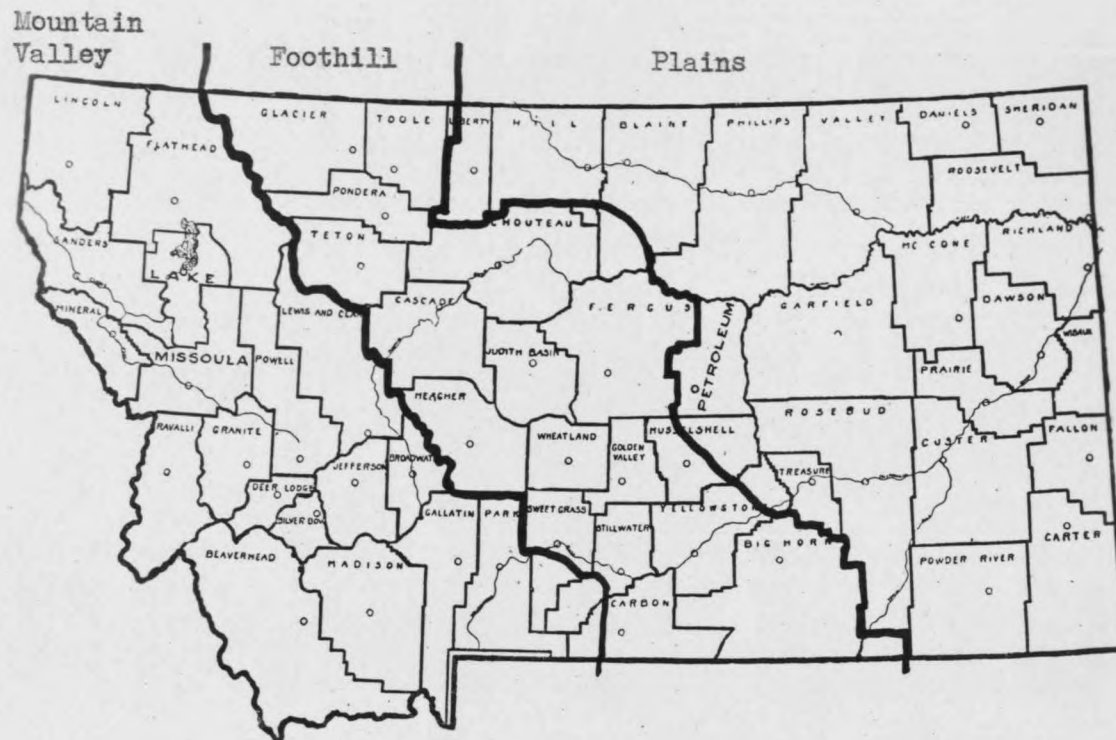


Fig. 1 - Showing the Three Major Regions of Range Beef Cattle Production in Montana (23)

The plains region is more level or rolling land; it is generally drier than the regions to the west. There has been, in the past, considerable cash grain and general farming in this area. Range livestock has been important, particularly in the rougher lands. There is generally less winter feeding due to a shorter period of snow cover.

According to Saunderson and Vinke (20), from the standpoint of range sheep production in Montana, the state is divided into two fairly well defined areas due to differences in operation practices and type of production (See Fig. 2). (A) Eastern Montana, or the Great Plains region, because of certain climatic differences and range types of forage, places emphasis upon wool production in most cases, with feeder lambs as a supplementary enterprise. (B) Western Montana, or the Intermountain region, with its more abundant water supply, higher and cooler summer ranges, and considerable use of National Forests or mountain and foothill ranges, produces lush green forage available throughout most of the summer season. These conditions, in addition to furnishing an abundance of succulent feed for lambs, increase the milk flow of the ewes which is of considerable importance in producing milk-fat lambs off the range at weaning time.

Breeding Practices

The fine-wool ewe of Rambouillet or Merino breeding is the foundation (4)(10) of the range sheep in Montana. In the past, the use of Rambouillet rams predominated in the eastern area due to the fact that wool production is emphasized in this area. Feeder lambs are a supplementary enterprise in the plains area generally since conditions are not conducive to fat lamb produc-

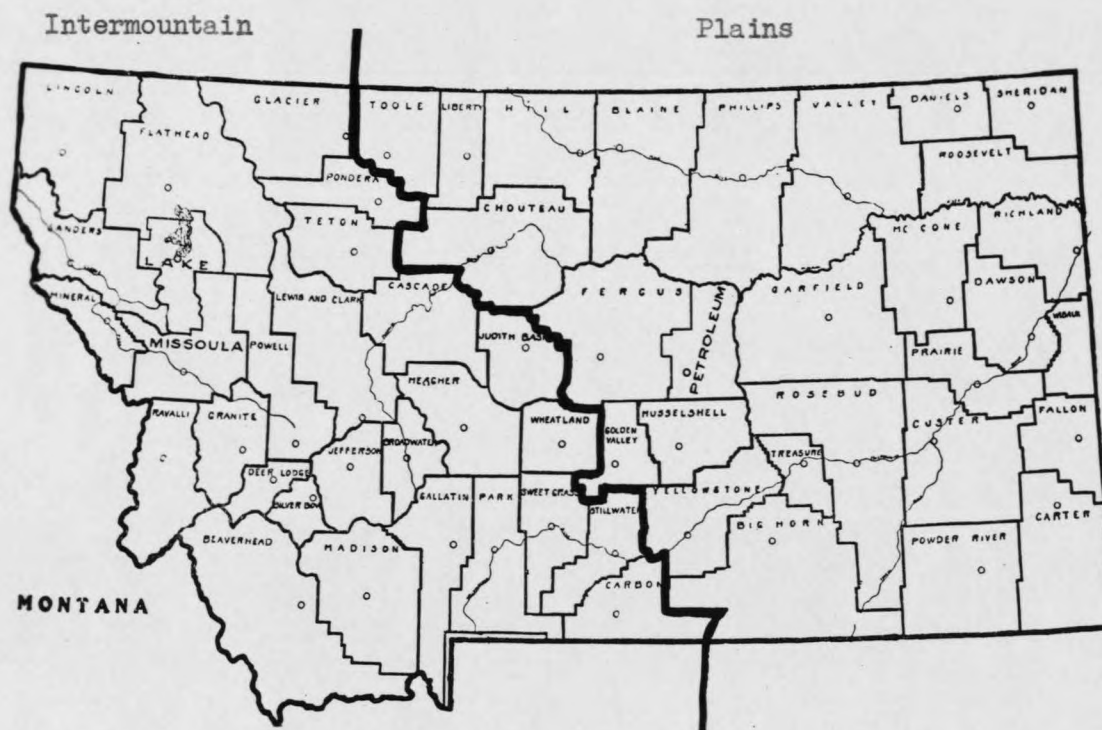


Fig. - Showing the Two Major Regions of Range Sheep Production in Montana (20)

tion. There has recently been an increasing tendency toward the use of the Corriedale and Columbia ram in crossing on the fine-wool ewes of the plains area in an effort to get away from wool-blindness, increase length of staple and size of ewe, and to increase the per cent of lamb crop.

In the intermountain area the practice of breeding the fine-wool native ewes to black-faced rams of mutton breeds has been generally accepted. In this area the succulent, more abundant vegetation and more advantageous summer grazing conditions generally are conducive to increased weight in the lambs, so that a fairly high percentage go to the markets as milk-fat lambs off the ewes at weaning time.

In the early years of beef cattle improvement in the state there was considerable use of Shorthorn bulls on the range cows of nondescript breeding. Hereford bulls later replaced the Shorthorns. Hereford calves were smaller framed at birth than Shorthorns and less difficulty was encountered at calving time. This was especially important when there was a feed shortage and the cows were allowed to become thin and weak before calving. Also, Hereford cattle were apparently better suited to range conditions, were better rustlers, and due to a heavier hide and coat of hair, were able to withstand the extremely cold and stormy winters more easily than the Shorthorns. At the present time, Hereford bulls are used almost to the total exclusion of other beef breeds for range beef production in Montana.

Part III

ECONOMIC FACTORS CONTRIBUTING TO SUCCESS

Land Utilization and Ecological Factors

Land utilization and the degree with which it conforms to "best" land use practices is of paramount importance in determining whether the operation of the plant will be successful or otherwise.

In the earlier land policy of our Government, it was considered desirable to get our public lands into private ownership. Other forces than "best" land use were urging this procedure, it is true, but nevertheless this policy was generally accepted to be conducive both to the best use of the land and to a permanent agriculture. Time has proven that this system of private ownership in many cases was not only undesirable from the standpoint of the individual, but also encouraged destructive use of the land.

Some factors which have encouraged land owners in destructive land use are:

1. Small incomes allowed no funds with which to practice the various forms of conservation.
2. Low incomes were often due to the fact that the lands which they occupied were sub-marginal for crop production, or for the type of production practiced.
3. Units were too small in size to provide an adequate income.
4. Speculative tendencies of the operators prevented them from following a sound, long-time program.
5. Such economic factors as maladjustment in farmer buying power

over-capitalization of plant, and indebtedness have aggravated misuse of resources.

6. Short-term leases on grazing lands, competitive bidding for leased land, and free use of Public Domain made it impossible for the operator to use these lands constructively.

Efforts are being made by the Bureau of Animal Industry, Farm Credit Administration, Bureau of Agricultural Economics (12), Division of Land Utilization (12), and the National Forest Service to make adjustments which will make possible the operation of a constructive, long-time agricultural policy.

Land Charge

Land charge is undoubtedly one of the most important single factors in determining ranch income. Readjustment in land charges, based on actual worth as determined by long-time productivity under proper use is fundamental in correcting the system of misuse of land. According to Tootell (34), "no single factor has had more influence in retarding private ownership of range land than high real estate prices and taxes".

The dry land farming era from 1910 to 1920 took place under unusually favorable moisture conditions. This, coupled with inflationary, war-time prices, gave a high net return to land which under anything like long-time average years of moisture conditions and price, would not have been economical to cultivate. This high net return was capitalized (22) in the form of high land values which were responsible for magnifying the price on adjacent range lands which were left unbroken.

The proof that land values were high, out of all reason with ability

to produce, lies in the fact that,

1. Farm mortgage debts have been repeatedly scaled down during the last 20 years.

2. According to Renne (18), "during the years 1898 to 1937, since the National Bankruptcy Act of 1898 has been in operation, almost 3,900 Montana farm bankruptcy cases have been concluded in the federal district courts". The cases recorded annually averaged less than ten per year prior to 1912 and 50 to 75 cases per year during the war years, but beginning in 1921, the number leaped upward to a peak of 693 cases recorded in 1924 (18). Since 1924, there has been a downward trend until at the present time there is an average of less than 50 cases annually. The tremendous increase in the proportion of bankruptcies of farmers during the 1920-1930 period, over those of laborers, miners, skilled workers, merchants and others(18), is indicative of the influence of maladjustment in land values. It must be remembered that agricultural lands were over-capitalized during the war-time period. This force was not felt in the other groups.

3. Farm real estate mortgage foreclosures reached an all-time high during the period 1920-1930. These, for this ten-year period, amounted to four-fifths of the total for the state from the time of the first foreclosure in 1870 up to January 1, 1938. This is a reflection of over-capitalization and indebtedness on farming lands which took place prior to 1920 (19).

4. The increase in tax delinquencies on dry-land farms which took place during the 1925-1934 period (16) is indicative of the maladjustment in property taxes on these lands.

Such an extensive record of scaled-down debts, bankruptcies, tax delinquencies, and mortgage foreclosures is certainly incriminating evidence

of improper use of resources, unjustifiably high land values, and of unreasonably high taxes. It is true that the years from 1929 to 1935, particularly, covered a critical economic period, not only for agriculture in Montana, but for the entire economic organization of the United States. Nevertheless, the high proportionate increase in the factors indicated above for Montana farmers and ranchers over those of people in other occupations in the state for the period shown, is proof that an important force, not to be found in the other fields, is to be met by the farming group.

The value of any property is directly related to the amount of net income it will produce over a long period of time. This period should not be short or the picture is likely to be distorted. It should be long enough to allow for a leveling off in such forces as price and ability to produce rather than to base these land values on prices alone which might prove to be at a point, temporarily high in the cycle of alternating high and low prices (29).

Big incomes were made in the early free range days of the range production industry. Many ranchers were able to start operations with a few hundred dollars invested in livestock and equipment. However, in the last 40 years, since the advent of the need for (a) greater control of the range through ownership and lease, (b) supplemental feed production, (c) money to pay high taxes, and high freight rates, the incomes of these ranchers have steadily declined. When proper consideration is given to the high cost of operation, it is obvious that only a narrow margin of net return remains with which to pay land charges. Range land values should be based upon long-time average price which may reasonably be expected for range products under conservative stocking practices.

Land Policy and the Farm Program

There are certain necessary adjustments to be made in Montana's agriculture (17)(31), the shifts toward which are becoming apparent. The Land Utilization Program under the United States Department of Agriculture has done much to help effect these adjustments through the purchase of sub-marginal lands. An effort should be made to get these lands permanently out of crop production so as to prevent another influx of farmers following an exceptionally good year or two of moisture conditions and prices. Once these lands are returned to grazing, the problem remains of following management practices which will most quickly return these areas to optimum carrying capacity for livestock. In other words, that procedure is necessary which will get these lands to producing the greatest quantity of the most palatable and desirable type of permanent vegetation in the least possible time. In order to do this, the ecological characteristics of the forage plants to be grown on the area must be considered.

Conservative grazing is of major importance in proper use of range land (35). The growth habits of the plants native to the area must be studied and a management plan developed to conform with these growth habits so as to allow proper development, propagation and improvement of the better types of forage.

For certain types of forage plants, seasonal use and deferred or rotation grazing systems are essential to range improvement. However, the habits of plant growth for the particular type of vegetation (13) growing on the area should be the guiding factor in determining the grazing program for that area. In some cases, artificial reseeding is desirable (26) and Crested wheatgrass is recommended (14) quite highly. Conservative stocking at all

time is absolutely necessary to range improvement. It must be remembered that over-grazing, augmented by heat and drought, is very injurious to ranges (25).

Development of water holes, springs, and reservoirs are practices of much value to the stockmen. Not only is the available water important in obtaining increased weight to the livestock, but it also prevents trailing and its attendant damage to range as well as to prevent extreme over-grazing on the sites of watering places.

Proper distribution of salt away from water holes is an important influence in proper distribution of livestock over grazing areas. It has been proved that stock will go to salt as well as they will to water if shown the location of the salting places.

Contour furrowing is a practice which justifies consideration in some areas of the state, especially in the drier or more windy sections. These furrows distribute the rain water over the hillsides and prevent considerable run-off. This distribution holds water on the land, giving it a chance to percolate down into the soil and is a factor in preventing water erosion and "gullying" (5). Contour furrowing is also a factor in preventing wind erosion and in holding the snow as it drifts over the ridges and in the furrows, making considerable moisture available for plant growth as the snow melts in the spring.

The Need for Sound and Adequate Credit Facilities

Inadequate credit facilities have been a factor of extreme importance to ranch operations in Montana. In the past farmers and ranchers have been handicapped because of the difficulty in furnishing a standard security.

The wide variation in production capacity of the different units, the wide spread in ability of operators, and the difficulty of eliminating speculative elements, were all factors in retarding the flow of capital from cities, and other points of concentration, to the farm. According to Tootell (33), "there is a definite need for more training in the business aspect of farming". Oftentimes, debts were accumulated during periods of rising prices, due to expansion of operation even more so than to increased cost of operation. These were carried and paid off during periods of falling prices and low incomes. An increase in farm and ranch indebtedness based on a temporary increase in farm prices, is an unsound policy and responsible for much of the hardship to the rancher as he struggles along with a decreasing income.

This type of credit, as exemplified by the older type of agricultural loaning agencies, is responsible for a considerable portion of over-expansion, increased indebtedness, over-capitalization, and the attendant misuse of resources by farmers and ranchers which, in turn, caused the difficulty of inducing the flow of credit from centers of accumulation to the farm.

Oftentimes, those with money to lend had little or no personal knowledge of agricultural operations. They accepted loans of operators at great distances who were operating under conditions unfamiliar to them. The variations in the different units, and their ability to pay, require study by a specialist who is familiar with the different types of land and able to develop information upon the character of the borrower, his reputation and ability to pay (32), as well as his needs for credit. In other words, it is necessary for the loaning agency to have a specialist on the ground to go over the plant and discuss credit needs of the operator; then, after

a careful study of the unit and operator, to make the loan on a basis of long-time production and prices. These things were impossible for the individual in the east who might otherwise have been willing to make loans if he could have been reasonably sure of his investment. The Federal Land Bank and Production Credit Associations are at present operating under a system which is adequately suited to make short and long-term loans to agriculture on a sound business basis.

The biological nature of agriculture necessitated the development of credit facilities not found in the earlier sources of agricultural credit, nor were the credit needs of agriculture the same as those of industry. For these reasons it was necessary that sources of credit be developed which would be suited for the special needs of the farmer and the rancher (8). The loans of the Federal Land Bank and Production Credit Associations are based upon actual earning capacity of the plant (32) and they attempt to "borrow the operators out of debt" rather than to loan their funds for the sole purpose of interest income (8). The extension of credit is made on a basis adapted to the needs of agriculture and involves:

1. Approaching loaning problems from the farmer's point of view.
2. Adjusting loan maturities, methods of repayment, and other loan conditions to the special needs of agriculture, and as nearly as possible to the individual needs of each.
3. Providing rapid and convenient service to borrowers such as,
 - (a) Convenient credit service in areas distant from Association headquarters whenever the business is sufficient

to justify the loaning expense.

- (b) Making money available within a short time after application,
- (c) Keeping good credit history on old members so that applications can be handled with a minimum of expense and delay,

4. Assisting members in better business practices,

- (a) Through long-time planning of their production operations,
- (b) By a methodical system of records,
- (c) By encouraging progressive practices for each individual enterprise.

Range Cattle Production Practices

The data upon which this study is based were obtained from the ranch records of 100 range cattle producers scattered in a shotgun pattern over the state. The study was conducted by Mr. M. H. Saunderson of the Department of Agricultural Economics at Montana State College. The study was made over the five-year period 1929-1933, the ranch operators were contacted at their headquarters for records of income and expense as well as operation practices which were considered to be pertinent to the study. In some cases the records of certified public accountants and banking institutions supplemented the above.

The writer collected the data for 1933 by going into the field and contacting the ranchers in the summer of 1934, and summarized the records

for the year 1933. He also worked on the five-year summaries of the material, compiled the tables and wrote most of the material shown herein during the winter of 1934 and 1935. The tables and considerable of the material shown herein were later used by Mr. M. H. Saunderson and Mr. D. W. Chittenden in the Montana Agricultural Experiment Station bulletin No. 341, "Cattle Ranching in Montana", and in the future will be referred to in this thesis as reference (23).

Annual Operating Costs per Head

Costs in terms of dollars and cents serve the purpose of a general index in studying differences in the characteristics and operating efficiency of individual ranches. Certain qualifications need to be noted, however, in applying past monetary and price averages and trends to an analysis of the present operating cost data of the individual ranch (23).

The first and most obvious of such qualifications is that the general price level has in the past been quite unstable and may continue to be so in the future. For this reason the use of indices or changes in the value of money itself may be necessary in applying the cost data of the past to that of the present. A second qualification in the use of past monetary cost data for the analysis of ranch operation is the fact that, due to changes in production technique or shifts in consumer demand, the value relationships of any one kind or type of agricultural commodity may, over a series of years, be more or less permanently changed. Again, it should be noted that the production costs of any group of cattle ranches are likely to differ considerably in any one year, and the costs on an individual ranch may vary over a series of years due to weather differences.

The important consideration is to have some standard yardstick by which variations in individual ranch costs and income can be observed and measured. These differences and variations should then be analyzed. This kind of analysis applies necessarily to the specialized agricultural producer who is operating a business enterprise rather than a small diversified family farm. For the typical Montana cattle ranch the use and management of resources outweighs the use of operator labor, costs are largely expressed in monetary payments, and the type of operation is sufficiently specialized that artificial separation of the costs of various enterprises of the same business unit is not necessary (1).

From 1929 to 1933, the average annual operating cost per animal unit for the ranches studied declined from approximately \$17.30 to \$13.00, or by about one-fourth. Actually, during the first 3 years of this period, operating costs rose due to relatively good cattle prices in 1929 and 1930. This reflects the trend toward expansion and the competition for labor and range. The rate of wages paid to year round ranch help was about \$40.00 a month in 1929, raising to \$45.00 in 1930 and to \$50.00 in 1931. Following 1931, the low beef prices forced a sharp reduction in cost rates and some reduction in the amounts of hired labor, supplies, and purchased feeds (mostly grain and cottonseed cake) used. Some such changes appeared to go further than was desirable in securing the most economic relationship between costs and returns.

Saunderson (23) reports that the average annual operating cost for the five-year period was about \$17.00 per animal unit. This includes an

accounting for the operator's labor time at the current wage scale. It does not include any figure for management return, any interest payment upon borrowed capital, or any interest return to the owner's equity in the investment. The percentage relationships in the various cost items for all of the ranches at the start and close of the five-year period are reported in Table I.

Table I, Cost Items Per Animal Unit for Montana Ranches, 1929 and 1933 (23)

	1929		1933	
	Amount:	% of Total	Amount:	% of Total
1. Labor	\$5.90	34	\$4.20	33
2. Supplies for hired labor	1.95	11	1.60	12
3. Feed purchased	1.75	10	1.55	12
4. Leases	1.75	10	1.20	9
5. Taxes (real estate and personal)	2.15	13	2.00	16
6. Depreciation on improvements and equipment	1.10	7	1.20	9
7. General ranch expense	2.70	15	1.20	9
Total	\$17.50	100	\$12.95	100

Table II, Operating Costs per Animal Unit by Regions, 1929 to 1933 (23)

	Mountain:	Supplies	Feed	Leases	Taxes	Depre- ciation	General	Total	Gross
Valley	:labor	:for hired	:pur-	:Leases	:Taxes	:on equip-	:ranch	:cost	:in-
	:labor	:chased:				ment	ex-		come
	:	:	:	:	:	:	:penses	:	:
1929	\$5.76	\$1.92	\$1.56	\$1.83	\$1.97	\$1.04	\$2.94	\$17.02	\$25.44
1930	6.38	2.13	3.17	1.18	2.12	1.06	3.00	19.04	20.44
1931	6.25	2.08	3.64	1.25	2.08	1.07	2.58	18.95	17.67
1932	5.10	1.70	3.12	1.35	2.05	1.23	2.56	17.09	12.20
1933	4.02	1.34	2.24	0.68	1.66	1.13	1.17	12.24	10.60
5-yr.ave.	5.50	1.83	2.75	1.26	1.97	1.11	2.45	16.87	17.27
Foothill									
1929	6.05	2.02	1.96	2.03	1.92	1.08	2.37	17.43	29.48
1930	7.28	2.63	1.04	2.24	2.32	1.19	2.30	19.00	20.93
1931	7.11	2.37	2.18	1.73	2.43	1.28	2.18	19.28	19.29
1932	5.17	2.22	1.49	1.81	2.31	1.40	2.09	16.49	16.45
1933	4.19	2.06	1.66	1.46	2.12	1.13	1.22	13.84	12.22
5-yr.ave.	5.96	2.26	1.67	1.85	2.22	1.22	2.03	17.21	19.67
Plains									
1929	5.87	1.96	1.79	1.39	2.51	1.19	2.85	17.56	24.29
1930	6.04	1.99	1.32	1.69	2.61	1.34	2.93	17.92	21.91
1931	6.85	2.28	2.31	2.09	2.40	1.19	2.45	19.57	8.73
1932	5.07	1.75	2.67	2.39	2.46	1.52	2.22	18.08	11.52
1933	4.40	1.47	0.74	1.40	2.26	1.22	1.15	12.64	12.24
5-yr.ave.	5.65	1.89	1.77	1.79	2.45	1.29	2.32	17.15	15.74

This shows labor and taxes as being the two cost items having the greatest resistance to downward change.

As may be seen from Table II, there was a small margin during this five-year period to carry interest charges in the mountain valley and foothill ranches, and none on the plains ranches. The foothill ranches show the best margin. The mountain valley ranches do a considerable amount of winter fattening of steers and dry cows on native hay, and market a considerable percentage of their livestock at west coast markets. The effect of a relatively unfavorable market price situation which developed in these markets in 1932 and 1933 may be noted in the income for these ranches. The effect of a severe drought upon prices and income may be noted for the plains ranches in 1931. The higher gross income of the foothill ranches reflects their natural advantage in being able to produce a good weight and quality of market and feeder animals. A relatively high tax cost situation may be noted for the plains ranches where land values and taxes have been more influenced by farming development.

There is not any marked difference in the total operating costs for these three regions of the state. The average ranch price of all cattle marketed for all of the ranches studied was slightly less than \$6.00 per hundredweight for the 1929-1933 period. This compared with an average of slightly over \$7.00 as the average Montana ranch price of beef cattle from 1910 to 1930. An average ranch price of \$7.00 can be expected to yield a gross income of about \$20.00 per unit of range cattle operated on a ranch with 100 head or more of cattle.

A gross income of this amount will require that the operating cost

does not exceed \$15.00 per cattle unit in order to yield a five per cent interest return upon a reasonable investment. The investment values which the ranch operators placed upon their properties in 1930 amounted to approximately \$150.00 per cattle unit. Sixty dollars of this was the unit value placed upon cattle, \$65.00 upon land (not including the value of leased land, which amounted to from one-third to one-half of the range land used), and the balance of the investment was in equipment, feed, work stock, etc. These undoubtedly represent inflated values from the standpoint of long-time trends. A reasonable investment per cattle unit in land would be nearer \$40.00 when one-third to one-half of the range land is leased, or \$60.00 if all land used is owned. The long-time trend of unit investment values in Montana range cattle is between \$40.00 and \$45.00. In the situation most nearly typical of the ranches studied, where a part of their land cost is in leases paid, the total capital investment per cattle unit should not greatly exceed \$100.00 and the average annual operating cost per cattle unit, not including the interest return to this investment, should not exceed \$15.00.

A variation up to 30 per cent either way from this average cost figure may be justified for individual ranches (23). This is about the extreme limit of differences due to differences in the characteristics and operating methods of the ranches. Any greater variation than this above the average is likely to indicate excessive and waste costs on the one hand; or if less than 70 per cent of the average, is very likely to indicate the uncertain use of unpaid-for range land, a low production of winter feed or other hazardous operating methods. Some of the mountain valley ranches that

were doing a considerable amount of winter fattening on native hay had an operating cost as much as 30 per cent above the average, with a correspondingly higher income. There were instances of plains ranches marketing feeder calves and yearlings and using some grain to increase market weights that could justify an operating cost 20 to 30 per cent above the average. Again, there were certain of the larger ranches, especially in the foothill and plains regions, engaged primarily in the running of steers purchased from outside sources at a unit cost 20 to 30 per cent below the average, and generally with a correspondingly lower gross income. These were generally ranches with a type of range where the topography, water, and range feed conditions were inherently better adapted to steers than to cows.

Production Costs by Type of Animal

An analysis of the ranch records as to production costs for the period 1929-1933 shows that there are no wide differences in the per hundredweight costs for calves, yearlings, or two- and three-year-old steers. Yearling animals showed the lowest production costs per hundredweight in all three regions. The foothill ranches showed the lowest production cost for the feeder calves marketed, the mountain valley ranches the lowest cost for the yearlings and two-year-old steers marketed. The fact that the foothill ranches had the lowest production cost for calves was due primarily to their higher per cent calf crop. Production costs per hundredweight run consistently higher for all classes of animals on the plains ranches (Table III). The weight of the three-year-old steers marketed from the mountain valley ranches does not show a gain from the two-year-old weights

comparable to the other regions. This is due primarily to the practice on some of these ranches of marketing this class of animals as three-year-olds in the spring of the year after winter feeding on native hay, rather than off the range as "long" three-year-olds in the fall.

Table III. Costs* and Weights for Different Ages of Cattle Marketed, 1922-33 (23)

	Mountain Valley Ranches	Foothill Ranches	Plains Ranches
Weights of calves marketed (in lbs.)	425	405	365
Production costs of calves marketed	\$25.00	\$22.50	\$24.00
Production costs per cwt. of calves	5.90	5.50	6.25
Weights of yearlings marketed (in lbs.)	735	684	660
Production costs of yearlings marketed	37.00	37.50	39.00
Production costs per cwt. of yearlings	5.05	5.30	5.90
Weights of 2-yr. old steers marketed (in lbs.)	985	920	885
Production costs of 2-yr. old steers marketed	52.00	52.50	53.00
Production costs per cwt. of 2-yr. old steers	5.25	5.70	6.00
Weights of 3-yr. old steers marketed (in lbs.)	1190	1185	1090
Production costs of 3-yr. old steers marketed	69.00	68.00	67.00
Production costs per cwt. of 3-yr. old steers	5.80	5.80	6.15

*Does not include any interest charge

The production costs shown in Table III do not include any charge for interest, either on money owed or on the ownership equity. A 5 per cent interest charge upon a reasonable investment would add approximately \$1.25 per hundredweight to the cost of calves, \$1.25 for yearlings, \$1.40 for two-year-old steers, and \$1.60 for three-year-old steers. The necessary

five-year average selling prices per hundredweight at the ranch to cover costs, including these interest charges for the period 1929-1930 would have been:

Table IV, Five-Year Average Selling Price per Cwt. at Ranch
to Cover Costs Plus Interest at 6 Per Cent (23)

	Mountain Valley Ranches	Foothill Ranches	Plains Ranches
Price per cwt. for calves	\$7.15	\$6.75	\$7.50
Price per cwt. for yearlings	6.30	6.55	7.15
Price per cwt. for 2-yr. old steers	6.65	7.10	7.40
Price per cwt. for 3-yr. old steers	7.40	7.40	7.75

This shows that the interest carrying charge becomes a significant item in the production of three-year-old steers, and that they must bring higher prices per hundredweight than other classes of animals in order to cover costs and an interest return. The necessary price differential between yearlings and two-year-old steers is not so marked, but it is still significant. Some ranches, because of natural adaptation for the production of two- and three-year-old (or disadvantages for other types of production) will probably continue to find this type of production the most profitable.

Labor Costs

Due to differences in the organization and operating methods of the ranches, there was a rather large variation between individual ranches in the amount of labor time used on the ranch per unit of livestock. This variation shown was greater than the actual variation in costs, due to the

fact that purchased feeds displaced ranch labor to a greater extent on some ranches. There were individual instances of small ranches with 100 to 125 head of cattle where the operator's labor time was all that was used throughout the year. Most of the ranches were able to handle about this many head of livestock per man year of labor time. A few of the larger ranches, particularly those marketing two- and three-year-old steers, were able to go considerably above this. Many of the smaller ranches of from 100 to 200 head of livestock found some difficulty in working out an economic combination of operator and hired labor time. Some of the ranches studied had supplemental income-producing enterprises for the use of any excess labor time.

Table V, The Averages and Variations in the Number of Cattle Units Run Per Man Year of Labor Time During the Five-Year Period (23)

	Mountain Valley Ranches	Foothill Ranches	Plains Ranches
Highest number handled per man year of labor time	150	180	190
Lowest number handled per man year of labor time	65	70	60
Average number handled per man year of labor time	125	120	110

The low average number handled per man year in the plains group reflects the influence of a larger percentage of small ranches in this group. There were three very large ranches in the foothill region that were handling as high as 250 head of livestock (steers) per man year of labor time (these records are not included in Table V).

Land Charges

The land charges on these ranches take the form of leases paid on leased lands, taxes paid on owned land, interest on land indebtedness, and for purposes of statistical comparison, an interest return imputed (in violation of orthodox economic theory) to the owner's equity based on what appear to be reasonable land values. The land charge enters into the determination of the costs of grass, hay, and other feeds produced.

Practically all of the ranches studied owned all of their hay and other crop lands and some range land. As may be noted in Table VI, a considerable percentage of range land was leased. About one-half of the mountain valley and foothill ranches had summer grazing permits on the National Forest, consequently the percentage of leased land is actually somewhat higher for these ranches than is shown by Table VI, which accounts only for range lands where the acreage used could be determined. About two-thirds of the plains ranches had some use of an indeterminate amount of open range in 1933.

Lease prices on range land did not decline to any considerable extent from 1929 to 1933. If all of the range land used and paid for had been secured at the prices paid on leased range, the annual cost of the grass per animal unit would have been about \$2.85 (including forest grazing fees) for the mountain valley ranches, \$3.25 for foothill ranches, and \$2.85 for the plains ranches. This compares with a cost of actual leases and taxes paid on range land, plus five per cent interest return on the reasonable value of owned range, of four to five dollars an animal unit as an average for all of the ranches during the five-year period (23). This shows a con-

siderable difference in cost between the leased and the owned range. The indications are that under competitive conditions, the range stockmen will pay in one form or another, 30 to 35 cents an animal unit per month for grazing. This is an average over a series of years. If grazing costs on leases on public lands are much below this point, the difference will be capitalized into the value of the hay and range lands owned by the operator and eventually appear as a cost through this channel.

Table VI, Range and Hay Land Used and Leased, 1929-1933 (23)

	Mountain Valley Ranches	Foothill Ranches	Plains Ranches
Acres of range land per cattle unit*	11	17	25
Average price paid per acre on leased land	.22	.19	.11½
Average per cent of range land leased	25	40	55
Acres of hay and crop land per cattle unit	1.2	1.0	1.0

*Does not include National Forest or grazing reserves.

Table VII, Grazing Costs on Individual Ranches (23)

Ranch Case No.	Number of Cattle Units	Total acres of control: exclusive of forest or grazing districts permits	Acres of leased range	Cost per acre of leased range	Per acre of value placed by operator on range land owned by him	Annual cost per acre of using owned range in taxes and interest (6%)	Cost of grazing permit on forest or grazing district. No. & cost per head	Total annual grazing cost per head	Avg. number of days on grass	Grazing cost per head
1 <u>a/</u>	745	2,100	1,000	90¢	\$10.00	80¢	100 75¢	\$2.50	245	1.0¢
2 <u>a/</u>	1310	4,000	2,000	75¢	8.00	60¢	800 65¢	2.45	215	1.1¢
3 <u>b/</u>	730	9,670	8,180	24¢	5.00	37¢	650 69¢	4.05	315	1.3¢
4 <u>b/</u>	650	8,200	4,000	25¢	5.00	37¢	500 88¢	4.60	295	1.6¢
5 <u>c/</u>	1090	25,140	640	10¢	2.50	20¢	620 1.10	5.10	310	1.7¢
6 <u>c/</u>	370	7,000	4,500	8¢	2.00	16¢	300 1.25	3.15	275	1.2¢

a/ Mountain valleyb/ Foothillc/ Plains

The differences in the cost of grazing on leased range compared with range owned by the operator are further illustrated by the individual ranch cost data shown in Table VII. Records Nos. 1 and 2 show a striking exception to the usual situation, however. These ranches are located in the Big Hole Basin in Beaverhead County, which is an area where the high elevation and related climatic factors have caused it to remain as strictly a range livestock type of community. The result has been lower land values and taxes in relation to the carrying capacity of the range. Note that these two records show an average range use (exclusive of forest permit) of about three acres to the head. This is irrigated and sub-irrigated native pasture. The lease rates paid for this land appear high on an acre basis, but the resulting per day grazing cost is lower than on most of the dry range lands. This situation as to the lower cost of grazing on owned range compared with leased range is, however, an exceptional one, and this is the only area of the state where such a relationship was indicated.

Records Nos. 3 and 4 of Table VII are located in the foothill region and it may be noted that, at the values of the owned range at which the operators indicated they would be willing to sell (1931), the costs per acre on owned range are considerably higher than the leased range. The quality and carrying capacity of the two kinds of range were about the same. Records Nos. 5 and 6 are plains ranches, and on both of these the cost of owned range is twice that of the leased range. Ranch No. 6 has a permit on a grazing district for most of the stock at a price which reduces the total annual per head cost of grazing to quite an extent.

There is a startling difference in the cost of maintaining a range

animal on range compared with hay. Most range operators appreciate this difference and do not maintain their herds on hay during the winter months longer than is necessary. An actual measurement of this difference in cost shows the economy (3), however, of management of range so as to shorten the length of the period of winter hay feeding as much as possible. One of the reasons for feeding hay is actual lack of grass rather than lack of availability of it due to snow cover. A comparison of the per day grazing costs shown in Table VII with the per day hay costs shown in Table IX shows that the maintenance cost on hay is three to six times as costly as on grass. These costs of maintaining an animal on hay are based entirely upon the per ton ranch cost of producing the hay and do not include the labor cost of feeding. This difference also indicates the margin for the use of cottonseed cake or other range supplements to lengthen grazing periods when grass is available.

Hay and Feed Costs

There is a large variation in the amount of hay fed and the length of winter feed period for the ranches of the three regions (Table VIII). The high average daily amount fed on the mountain valley ranches (nearly 20 pounds per cattle unit), reflects the practice of doing some winter fattening of steers and dry cows on native hay. About one-half or more of the ranches in all three areas fed some grain to the calves during the winter months. As shown in Table VIII, there was a large variation in the practice of individual ranches as to the amount of grain fed. The grain was not produced on the ranches as a rule, but was generally purchased from cash grain farms or grain dealers in the locality. The practice of buy-

ing oats, wheat and other small grains for this purpose indicates an economic inter-relationship between range livestock production by ranches and grain production by farms. The cost of grain and cottonseed cake purchased is shown in Table I under "feed purchased". This cost item does not include the purchase of much hay since but few of the ranchers bought hay; however, it does include salt. As shown by Table VIII, a number of these ranches fed some grain and cottonseed cake, generally as a range and winter feed supplement, to cows.

Table VIII. Average Use of Winter Feeds and Range Supplements (23)

	Mountain Valley Ranches	Foothill Ranches	Plains Ranches
Pounds of hay per animal unit	2300	1650	1140
Number of days of winter feeding period	120	100	90
Percentage of ranches feeding grain to calves (%)	45	60	45
Individual ranch variations in amounts of grain fed per calf (lbs.)	30-190	50-200	50-250
Percentage of ranches feeding grain and cottonseed cake to cows (%)	15	35	25
Individual ranch variations in amount of grain and cottonseed cake fed per cow (lbs.)	25-100	25-180	50-250

Table IX, Hay Costs on Individual Ranches (Average 1929-1933) (23)

Ranch Case No.	Acres of irrigated hay land	Acres of dry hay land crop	Hay Production Costs per Ton Without land charge	Including land charge	Hay fed per cattle unit (approximate amounts, in tons)	Hay cost per cattle unit	Number of days winter feeding	Cost of hay per day per cattle unit for days on hay feed
1 a/	1500	-	\$2.15	\$5.10	1.50	\$7.50	120	6.2¢
2 a/	2500	-	1.95	4.15	1.85	7.90	150	5.3¢
3 b/	150	300	5.85	8.25	.40	3.40	50	6.9¢
4 b/	200	100	5.75	8.15	.50	4.15	70	5.8¢
5 c/	500	-	4.25	6.60	.50	3.10	55	5.6¢
6 c/	105	95	4.10	6.70	.50	3.55	75	4.7¢

The differences in per ton costs of producing hay on individual ranches is shown by Table IX. These ranch cases are the same and correspond by number to the ranch grazing cost data in Table VII. Ranches Nos. 1 and 2 put up native hay from large fields and use large scale and power equipment in the form of large hay rakes or "sweeps" and "beaverslide" stackers, also power bullrakes and mowers to some extent. Mechanical power equipment is not used to any extent; however, it seems to be gaining in importance. The practice on these ranches is to divide their cattle into a range herd, and a beef herd in the fall of the year. The animals in the former are winter fed native hay at a rate of 16 to 18 pounds daily. The latter are fed at the rate of 22 to 24 pounds daily.

Ranches Nos. 3 and 4 are in an area where hay production costs are high, but range is comparatively good and generally adapted to a long grazing season. Consequently, while the production costs per ton of hay are high, the cost per animal is not out of line. Ranches Nos. 5 and 6 are in the plains region of the state.

Equipment Depreciation Costs

The annual depreciation cost on buildings and improvements and haying equipment varied between 50 cents and \$1.90 per animal unit in cattle on the ranches. This variation was due primarily to variations in the investment costs in these items. Some ranches had a location and a type of operation which required very little investment in shelter. There was a noticeable tendency for the smaller ranches to substitute labor time for investment in haying machinery and other types of labor-saving equipment.

Range Sheep Production Practices

The data upon which this study is based were obtained from the ranch records of 100 range sheep producers scattered widely over the state. The study was conducted by Mr. M. H. Saunderson of the Department of Agricultural Economics at Montana State College. The study was made for the five-year period 1928-1932; the ranch operators were contacted at their headquarters for records of income and expense, as well as operation practices. The records of certified public accountants and banking institutions were used in some cases as supplemental sources of data.

The writer worked on the five-year summaries of this material (38) in the winter of 1933 and 1934. The tables shown herein were compiled from unpublished data of this study, unless otherwise indicated, and will hereinafter be referred to by the reference number (38) of this publication. For further information see publication of Saunderson and Vinke (20), "The Economics of Range Sheep Production".

Range Sheep Production

The size of the units in the plains area of Montana, which produces sheep as a major enterprise, varies from outfits running 1,000 to 30,000 head. Some of these ranches have as supplemental enterprises the production of cattle in which the numbers vary from 50 to 350 head. A cropping program in some cases supplements the livestock enterprise and consists in the main of wheat production (20).

Some factors of importance in determining the extent of operations relative to numbers of sheep run are the economic use of and availability of,

1. Equipment and labor.
2. Conditions of land tenure.
3. Managerial ability and financial resources.
4. Physical characteristics of the country in which operations are to take place, such as a balance of range resources, hay production possibilities, and the possibility of organizing a natural ranch unit.

Probably the most important of these is the financial organization and managerial ability of the operator, followed by physical characteristics of the plant.

The size of bands varies from 1,000 to 1,500 head of ewes with lambs on summer range, largely depending upon the type of country where they are run. If the country is fairly open, level, or rolling, the larger bands are run satisfactorily, but if the country is badly broken or otherwise arranged so that the sheep become easily separated, the lower figures may be more satisfactory. However, in the plains area bands of 1200 head of ewes with lambs should be the minimum size in most cases and is considered to be the operating unit. On ranches running two bands or more certain combinations can be worked out that will make possible more complete use of labor, equipment and resources. There are certain fixed costs of overhead and production for one band in the way of improvements, equipment and labor which may be utilized by and charged to the additional bands.

Some of the management practices which are worked to advantage are,

1. Sorting sheep according to ages, running these in separate bands and thus more completely utilizing the

various types of range and feed, rams, lambing sheds, etc.

2. More complete use and specialization of labor and equipment in ranching operations.

Considering these factors, the economic size for sheep outfits would be two winter bands of ewes; the size of these will vary from 1800 to 2200 or 2300 head. This would allow for three bands of ewes with lambs on summer range and the greater part of the equipment necessary to handle one band would still be adequate.

The addition of a range cattle enterprise will make possible a more complete use of range and feed. The sheep fail to utilize to good advantage the tops of haystacks, some of the coarser hay, certain of the coarser roughage, and certain types of the range land will be satisfactorily used by cattle whereas they would be of little use to the sheep. Also there is a difference in requirements of seasonal labor.

Wheat production can work in nicely with a livestock program in areas suited to wheat production. Such a combination will make possible more nearly year round use of labor, more complete use of equipment and work stock, and provides a diversification of income. Also, in poor years the grain crop might be used advantageously for livestock feed.

Annual Operating Costs per Head

Costs in terms of dollars and cents are shown in this study for the purpose of giving a general index for studying the differences in the characteristics and operating efficiency of individual ranches. Certain qualifications need to be considered in applying past monetary cost and price

averages to an analysis of present operating cost data for individual ranches (20).

The important consideration is to have some measure as a basis for comparison of the costs and incomes of not only the two areas of the state, but also of the individual operators within those areas. Then the reasons for these differences and variations should be analyzed. These analyses apply necessarily to the specialized agricultural producer operating a business enterprise rather than to the diversified operator on a small family farm.

During the years 1928 to 1932, the average operating cost per head (See Table X) for the ranches studied declined slightly in excess of 47 per cent. Operating expenses rose from 1928 to 1929 due to the relatively high prices received for lambs and wool. This reflects the competition for labor and range as well as the tendency to expand during periods of rising prices. Wage rates for ranch and sheep labor rose from \$70.00 per month in 1927 to \$75.00 in 1928, but declined to \$65.00 in 1929, \$50.00 in 1930 and to \$35.00 and \$30.00 in 1931 and 1932, respectively. Following the sharp decline in wool and lamb prices that began in 1929 and continued through the period it was necessary to reduce costs of operation through unit costs as well as through unit input of items of expense.

The average annual operating cost for the five-year period was about \$4.80 per head of ewes run in the intermountain region and \$4.05 in the plains region (See Table XI). Operator labor was figured at the current wage rate and included in cost of operation. Interest on borrowed capital

or owner's equity was not included in the above figure, nor was any return imputed for management return.

Table X, The Average Relationship of the Various Per Head Cost Items of all Ranches Studied in the two Areas at the Beginning and Close of the Study (38)

Intermountain Region	1928		1932	
	: Amount	: Per cent of total	: Amount	: Per cent of total
1. Labor	\$2.37	36	\$1.16	34
2. Supplies for hired labor	.76	12	.38	11
3. Feed purchased	1.18	18	.37	11
4. Auto and trucking	.39	6½	.18	5
5. Ranch supplies and expense	.73	11	.33	10
6. Leases	.36	6	.32	9½
7. Taxes	.40	6½	.36	10½
8. Depreciation on bldgs. and equip.	.30	4	.29	9
Total	\$6.49	100	\$3.39	100
Plains Region				
1. Labor	2.17	39	.86	35
2. Supplies for hired labor	.72	13	.28	11
3. Feed purchased	.94	17	.35	10
4. Auto and trucking	.19	3	.15	6
5. Ranch supplies and expense	.54	10	.21	9
6. Leases	.43	8	.20	12
7. Taxes	.40	7	.22	9
8. Depreciation on bldgs. and equip.	.21	3	.19	8
Total	\$5.60	100	2.46	100

Table XI, Average Operating Costs Per Head by Regions
1928-1933 (38)

Year:	Labor	Board*:	Feed & Salt	Auto & Truck	Ranch & Sup. Expenses	Leases	Taxes	Depr. on: Bldgs. & Equip.	Total Oper. Cost
Intermountain									
1928	\$2.37	.76	1.18	.39	.73	.36	.40	.30	6.49
1929	2.15	.74	1.02	.28	.58	.36	.38	.30	5.61
1930	1.90	.63	.62	.23	.42	.34	.35	.30	4.79
1931	1.38	.40	.35	.17	.34	.27	.33	.29	3.53
1932	1.16	.38	.37	.18	.33	.32	.36	.29	3.39
5 yr. ave.	1.79	.58	.71	.25	.48	.33	.36	.30	4.80
Plains									
1928	2.17	.72	.94	.19	.54	.43	.40	.21	5.60
1929	1.97	.66	.92	.17	.54	.43	.40	.21	5.30
1930	1.44	.31	.52	.15	.32	.44	.40	.20	3.78
1931	1.06	.29	.44	.14	.31	.44	.26	.19	3.13
1932	.86	.28	.25	.15	.21	.30	.22	.19	2.46
5 yr. ave.	1.50	.45	.61	.16	.39	.41	.34	.20	4.05

*Board for hired help

Table XI shows a marked decrease in labor cost. However, this decrease is practically all attained by reducing the amount paid to labor rather than reducing the man months of labor. The items of leases, taxes and depreciation are largely fixed charges which, during this period, remained nearly the same. The fact that the amount "paid" for leases and taxes shows some decrease can largely be attributed to the fact that in some cases taxes were allowed to go delinquent and leased lands were used and no lease payment made.

Other reductions which were made in such items of expense as auto and trucking, ranch supplies and expense, indicate the fact that necessity demanded reductions and these items lend themselves to such temporarily through postponed upkeep and replacement costs which normally would have

been taken care of. Decreased costs in feed and salt are due to the fact that the sheep were kept on the range longer, fed less concentrates, and were not kept in as high a degree of flesh. Some of these reductions in costs, especially in feed, appear to go farther than desirable in securing the most economic relationship between costs and returns. This is shown particularly in decreased lamb crops, decreased weight in lambs, and increased death loss.

The variation in different cost items in the two areas indicates a difference in methods of operation followed as well as in certain land use practices. In the intermountain region, it is observed that such items as labor, feed, auto and trucking, ranch supplies, and depreciation are higher than in the plains region. This bears out the fact that there is more winter feeding and shed lambing in this area which require more labor, hauling of feed and supplies, increased need for supplies because of the above, and heavier investment in equipment and various items of machinery for hay production and feeding use.

Tax costs for the two areas are fairly comparable, but the slightly higher charge in the intermountain region is attributed to somewhat greater percentage of owned land and higher value of improvements and equipment.

Lease costs per head are higher in the plains regions due to proportionately higher leased range cost as based upon carrying capacity due to competition with dry land farming in the area, as well as higher per cent of range land leased.

Table XII. Average Investment Costs Per Head (38)

	Intermountain	Plains
Assets:		
Land	\$11.77	\$12.02
Buildings and improvements	2.00	2.14
Machinery and equipment	1.02	.90
Work stock	.20	.17
Total fixed	\$14.99	\$15.23
Total Assets*	25.75	26.28
Liabilities:		
Sheep	4.38	3.55
Land	4.30	2.78
Total	\$8.68	\$6.33

*Includes value of sheep and feed on hand as of January 1.

The figures shown in Table XII should not be considered as actual amounts to be used as the basis in considering average investment. They are based upon inflationary, 1928, values for both areas. They do, however, show the relative distribution of investment in the two areas.

Size of Units

The size of units varies considerably within the two areas, sheep numbers varying from 1,000 head upward (Table XIII). On some ranches which have range cattle in addition to the sheep enterprise, the number of cattle run will vary from 50 to 350 head or more.

Table XIII. Average Ranch Organization (38)

	Intermountain	Plains
Number of sheep run	6,700	2,670
Acres range owned	9,894	3,962
Acres range leased	7,119	10,755
Tons of hay produced	1,122	228
Tons of straw produced	26	30
Bushels of grain produced	918	1,211

The average number of sheep run by ranches during the period studied shows decidedly larger numbers run in western Montana. This no doubt is due, in some degree, to dry years and heavy liquidation in the plains area, as well as to the small sample taken.

Considerably higher percentages of owned to leased land in the intermountain area influence very materially the stabilization of operations in that section. This is borne out in average sheep numbers for the five years of the study in the two areas (20). Table XIV shows the average number of sheep run in the two areas in 1928.

Table XIV. Size of Ranches by Regions in 1928 (20)*

No. of ewes	No. of bands	Number of Ranches	
		Intermountain	Plains
1,000 - 1,500	1	10	9
1,600 - 3,000	2	5	7
3,100 - 4,500	3	8	9
4,600 - 6,000	4	6	5
6,100 - 7,500	5	9	5
Over 7,500	6 +	2	5
Total		40	40

*Taken from bulletin indicated.

The fleece weights of the sheep in the two areas are approximately the same (Table XV) and indicate a predominance of fine-wool breeding in the ewe bands of both regions.

Table XV. Average of Factors Affecting Income for the 1928-1932 Period (38)

	% death loss	% lamb crop	Lamb weight	Fleece weight
Intermountain	7.25	84.19	74.81	10.03
Plains	6.50	76.00	65.00	10.18

Table XV indicates the increased emphasis placed upon lamb production in the intermountain area, both in per cent lamb crop and in weight of lambs as has been mentioned previously in this thesis.

Table XVI shows the variations between the intermountain and plains regions in certain operation practices.

Table XVI, Average of Factors in Operation Costs
for the two Regions, 1928-1932 (38)

	: Pounds of : hay fed	: No. of days on : winter feed	: No. head run : per man
Intermountain	365	120	400
Plains	193	86½	485½

Table XVII, Prices Paid to Farmers for Lamb and Wool and
Index of Lamb and Wool Prices Combined in Montana
1910-1936 (28)

Year	Prices paid to farmers for		Index of lamb and wool prices (1910-14 = 100)
	Lambs per cwt.	Wool per pound:	
	:	:	
	Dollars	Cents	
1910	5.50	18.0	98.0
1911	5.38	17.0	94.3
1912	5.70	18.9	102.3
1913	5.77	17.5	99.1
1914	6.41	18.0	106.4
1915	6.68	24.9	128.8
1916	8.07	29.6	152.1
1917	12.25	48.4	240.1
1918	13.87	57.8	279.7
1919	12.64	58.0	268.9
1920	11.62	41.8	216.9
1921	6.62	19.0	110.9
1922	9.52	33.5	175.8
1923	10.20	38.8	196.0
1924	10.18	39.3	197.1
1925	11.85	40.8	216.4
1926	11.25	25.0	195.6
1927	10.87	32.8	186.4
1928	11.23	37.8	202.8
1929	11.27	32.8	190.1
1930	7.48	23.5	128.1
1931	5.10	15.2	87.0
1932	3.86	10.3	62.6
1933	4.54	18.8	91.2
1934	5.38	23.5	111.3
1935	6.47	19.5	110.8
1936	7.42	26.4	137.7

Part IV

SUMMARY AND CONCLUSIONS

On the basis of the data presented in this thesis, it can be stated that the factors affecting the economic welfare of ranching in Montana rank in importance in the following order.

1. The success or failure of Montana ranches is first of all dependent upon an appraisal of physical factors and the adaptation of the unit to them. No set rule is applicable to the state, or even to the smaller, more localized areas due to the wide variation in such factors as topography, soil, climate, duration of snow cover, etc. These should be studied and their analysis determine the type and extent of farm or ranch operations to be practiced upon each individual unit. Land charge and values should be based on probable long-time productivity and prices.

History shows the need for planning a definite program for the unit, based upon adaptability to its surroundings, then following this program through. Montana as a state is in a dry, not a wet, area as is often indicated by reference to "normal" years. As proof of this we have forage development and soil profiles which could have been built up only under semi-arid conditions. This necessitates conservative stocking of our range lands at all times and the building up of feed reserves for unusually dry growing seasons or winters of more than usual severity.

A plan of operations should be followed which will make for more complete year round utilization of labor, and a minimum of temporary or seasonal employment.

Speculative activity has no place in a sound program of operations.

It upsets the organization of the plant, causes misuse of resources, and is often fatal to the financial program of the operator. This is borne out by the past experiences of the dry land farmer and his futile attempts, over a period of years, to cultivate areas which were fundamentally suited to grazing only. Dry land farming was temporarily successful in years of unusually high moisture and price conditions, but in the long run, left the operator hopelessly involved financially and many acres of grazing land wasted.

The dry land farmer was not the only one guilty of speculative practices. Many cattle and sheep ranchers have, in the past, increased their herds and flocks during periods of rising prices and been forced to liquidate due to pressure of resources, or creditors, at prices ruinous to their enterprise.

2. The management and ability of the operator is probably the most important factor in success or failure once the plant is organized in harmony with its surroundings. A small increase in unit production, i.e., calf or lamb crop, tons or bushels per acre, etc., often makes the difference between the paying of annual expenses of operation, plus a fair profit, or of going behind financially. Once a ranch is established in harmony with its surroundings, the production factor is largely dependent upon the managerial ability of the operator. It is necessary for him to do everything economically feasible to increase, not only his total output, but also the quality of the commodity produced. There are certain fixed charges and overhead costs to be met regardless of the crop produced, and the fewer the units of salable goods, or the poorer their quality, the higher will be

their proportional share of these expenses.

The sale of produce alone may determine whether or not the year's operations will be successful. The time to sell, and often the bargaining power of the individual and his ability to obtain advantageous prices for his commodity, may be the deciding factor.

3. Keeping a complete and accurate set of records and planning a definite budget of expenses and income is foreign to many farm and ranch operators. Farming is a business, in many cases a business of considerable magnitude, and no business can hope to be successful for long unless a systematic plan of financing is inaugurated.

If the cost of different operations and the returns from them are known, it may well be possible to make certain adjustments which will increase the financial returns of the operator.

4. Death loss in livestock must be held at a minimum. This factor alone may play an important part in determining the financial success or failure of the year's operations. Losses must be held to a minimum if success is to be anticipated since the results of the year's operation may depend upon this factor alone. The cow and the ewe are carried through the year for the calf, the lamb and the wool which they, respectively, will produce and the loss of either the calf or lamb will mean total loss of all monies expended for carrying the breeding animal for a year. In case the mature animal dies, the original investment is lost in addition to the annual carrying charge. It is possible to insure supplementary feed crops against the so-called "Acts of God" and once the crop is in sight, it would seem a wise business policy to protect the investment rather than to go

ahead in a haphazard manner, staking everything on chance and trusting to "luck".

5. Prices are often given entire blame for the financial condition of the agricultural group. Prices are important, but the writer has placed this factor last in the group in determining the success or failure of agricultural operations, largely because it is less subject to the control of the operator.

Price, as referred to here, indicates the general price level of agricultural commodities and does not refer to the selling price received by the individual operator who may be more or less of an opportunist. Some men may consistently receive unusually good prices and appear to have the ingenious ability required to sell at the one particular time each year when prices are the highest. The exception is the livestock producer and/or feeder who may fatten his livestock to a high degree of finish one year, may not fatten at all the next, or may put the stock on a fattening ration and sell at any time during the feeding period; the man who appears to have "inside" information which enables him to sell at just the right time to receive the highest profit for his commodity. Most producers are not so fortunate and, while a large share of them try to take advantage of unusually good price situations, may lose money by trying to manipulate their sales so as to receive more advantageous prices. In most cases, as far as the individual is concerned, better results would be obtained over a period of years by selling his produce when it is ready to go to market. Even though the price may increase to some extent, the added weight of the feeder animal may cause it to drop to a lower grade if it is held for higher prices

after it has reached satisfactory finish. The cost of feed and the additional expense involved will be another item which will again decrease the anticipated margin of profit.

While all of this may come under the heading of "price", it seems to the writer to come more properly under the head of "management" as listed under Part 2 of this summary. Price and selling, from this point of view, might easily become the determining factor in the success or failure of the operating unit. However, from the standpoint of factors contributing to the success or failure of Montana ranches, price here refers to general price level of agricultural produce.

Probably the most logical method for the agricultural producers to increase their general price level is through systematic marketing of products, improved system of grading and standardizing their product, and by improving the quality of the goods marketed (1). In the case of certain commodities particularly this can, no doubt, be most satisfactorily effected by cooperation on the part of the producer. Wool, for example, might be graded so that each individual would receive payment based upon the merits of his clip instead of taking the "going price". Grading of such a commodity is a highly technical job and requires the services of a specialist who could be brought in by a cooperative group whereas the cost would be prohibitive to an individual. It is true that the producer of an inferior product would prefer to receive payment based on the average quality of goods produced in his neighborhood, but payment based on actual merit of the good is only just and would tend to improve quality in the farmer's produce.

The federal farm programs are endeavoring to draw the agrarian pop-

ulation together into one group which will organize their programs, not only in harmony with each other, but also in harmony with best land use practices.

While the governmental farm programs have met with considerable opposition and criticism, they have gone far along the road toward improving practices of land use and conservation of resources. They have done more toward bringing together and organizing the farming class than anything heretofore. The production and control programs inaugurated will, under very complete cooperation on the part of the producers, do much to eliminate large surpluses and thereby tend to raise the general price level on farm commodities.

It appears to the writer that the factors contributing to the success or failure of Montana ranches rank in importance in the order named. However, satisfactory results with regard to any one, or even with several of the factors, may easily be overbalanced to such an extent as to give a negative value if even one of the other factors is neglected to such an extent that exceptionally poor results in regard to it are forthcoming.

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LITERATURE CITED

- (1) Baker, A. L.
1938. COMPARISON OF ALFALFA AND WESTERN WHEATGRASS HAYS FOR WINTERING YEARLING HEIFERS IN THE NORTHERN GREAT PLAINS AND THEIR INFLUENCE ON SUMMER GAINS. U. S. Dept. Agr. Tech. Bul. No. 635, 8 pp.
- (2) Black, W. H., Baker, A. L., Clark, V. I., Mathews, O. R.
1937. EFFECT OF DIFFERENT METHODS OF GRAZING ON NATIVE VEGETATION AND GAINS OF STEERS IN NORTHERN GREAT PLAINS. U. S. Dept. Agr. Tech. Bul. No. 547, 19 pp.
- (3) Black, W. H., Clark, V. I.
1938. EFFECT OF SUPPLEMENTING WINTER AND SUMMER RANGE ON GAINS OF STEERS IN THE NORTHERN GREAT PLAINS. U. S. Dept. Agr. Tech. Bul. No. 628, 16 pp., illus.
- (4) Cooper, J. M.
1933. RANGE SHEEP PRODUCTION. U. S. Dept. Agr. Farmers' Bul. No. 1710, 34 pp., illus.
- (5) Craddock, George W., Pearse, C. Kenneth
1938. SURFACE RUN-OFF AND EROSION ON GRANITIC MOUNTAIN SOILS OF IDAHO AS INFLUENCED BY RANGE COVER, SOIL DISTURBANCE, SLOPE, AND PRECIPITATION INTENSITY. U. S. Dept. Agr. Circ. No. 482, 24 pp., illus.
- (6) Craddock, G. W., Forsling, C. L.
1938. THE INFLUENCE OF CLIMATE AND GRAZING ON SPRING-FALL SHEEP RANGE IN SOUTHERN IDAHO. U. S. Dept. Agr. Tech. Bul. No. 600, 43 pp., illus.
- (7) Eckert, P. S., Slagsvold, P. L.
1938. MONTANA CATTLE SHIPMENT Sources, Destinations, and Character of Montana's Cattle Shipments. Mont. Agr. Expt. Sta. Bul. No. 358, 44 pp., illus.
- (8) Henry, Ernest E.
1938. SECRETARY'S HANDBOOK FOR TWO-DAY CONFERENCE ON THE PRODUCTION CREDIT SYSTEM. 162 pp. Used at Bozeman Production Credit Ass'n Meeting for Employees and Inspectors of the Associations, held at Bozeman, Mont., Sept. 8-9, 1938, 162 pp.
- (9) Hitchcock, A. A.
1935. MANUAL OF GRASSES OF THE UNITED STATES. U. S. Govt. Printing Office, Wash., D. C., 1040 pp., illus.

- (9a) Hultz, Fred S., M.S., Ph.D.
1930. RANGE BEEF PRODUCTION in The Seventeen Western States.
John Wiley & Sons, Inc., New York, and Chapman and Hall,
Ltd., London, 208 pp., illus.
- (10) Hultz, Fred S., M.C., Ph.D., and Hill, John A., B.Sc.
1931. RANGE SHEEP AND WOOL in The Seventeen Western States.
John Wiley & Sons, Inc., New York, and Chapman and Hall,
Ltd., London, 374 pp., illus.
- (11) Johnson, Neil W., Saunderson, M. H.
1936. TYPES OF FARMING IN MONTANA - Pt. I, Physical Environment
and Economic Factors Affecting Montana Agriculture. Mont.
Agr. Expt. Sta. Bul. No. 328, 79 pp., illus.
- (12) Land Utilization Program, Bureau of Agricultural Economics, U. S.
Dept. Agr.
1939. THE LAND UTILIZATION PROGRAM FOR THE NORTHERN GREAT PLAINS
Northern Great Plains Region, Headquarters, Lincoln, Neb.,
15 pp. illus.
- (13) McCarty, Edward C.,
1938. THE RELATION OF GROWTH TO THE VARYING CARBOHYDRATE CONTENT
IN MOUNTAIN BROME. U. S. Dept. Agr. Tech. Bul. No. 598,
24 pp., illus.
- (14) Mercer, Ralph D.
1938. CRESTED WHEATGRASS IN MONTANA. Mont. Agr. Expt. Sta. Circ.
No. 92, 12 pp., illus.
- (15) Price, Raymond
1938. ARTIFICIAL RESEEDING ON OAK-BRUSH RANGE IN CENTRAL UTAH.
U. S. Dept. Agr. Circ. No. 458, 19 pp., illus.
- (16) Renne, Roland R.
1936. READJUSTING MONTANA'S AGRICULTURE, VIII. Tax Delinquencies
and Mortgage Foreclosures. Mont. Agr. Expt. Sta. Bul. No.
319, 27 pp., illus.
- (17) Renne, Roland R.
1936. MONTANA LAND OWNERSHIP An Analysis of the Ownership Pattern
and Its Significance in Land Use Planning. Mont. Agr. Expt.
Sta. Bul. No. 322, 58 pp., illus.
- (18) Renne, Roland R.
1939. MONTANA FARM BANKRUPTCIES A Study of the Number, Character-
istics, and Causes of Farm Bankruptcies Over a Forty-Year
Period with Some Suggestions for Preventing Them in the
Future. Mont. Agr. Expt. Sta. Bul. No. 360, 53 pp., illus.

- (19) Renna, Roland R.
1939. MONTANA FARM FORECLOSURES Number, Characteristics, and Causes of Farm Mortgage Foreclosures Over a Seventy-Year Period, With Some Suggestions for Reducing Them in the Future. Mont. Agr. Expt. Sta. Bul. No. 368, 58 pp., illus.
- (20) Saunderson, M. H., Vinke, Louis
1935. THE ECONOMICS OF RANGE SHEEP PRODUCTION IN MONTANA. Mont. Agr. Expt. Sta. Bul. No. 302, 55 pp., illus.
- (21) Saunderson, M. H.
1936. READJUSTING MONTANA'S AGRICULTURE V. Economic Changes in Montana's Range Livestock Production. Mont. Agr. Expt. Sta. Bul. No. 311, 30 pp., illus.
- (22) Saunderson, M. H.
1936. A STUDY OF THE TRENDS OF MONTANA LIVESTOCK NUMBERS, PRICES AND PROFITS. Mont. Agr. Expt. Sta. Bul. No. 329, 20 pp., illus.
- (23) Saunderson, M. H., Chittenden, D. W.
1937. CATTLE RANCHING IN MONTANA An Analysis of Operating Methods, Costs, and Returns in Western, Central and Eastern Areas of the State. Mont. Agr. Expt. Sta. Bul. No. 341, 32 pp., illus.
- (24) Savage, D. A.
1935. METHODS OF REESTABLISHING BUFFALO GRASS ON CULTIVATED LAND IN THE GREAT PLAINS. U. S. Dept. Agr. Circ. No. 328, 20 pp., illus.
- (25) Savage, D. A.
1937. DROUGHT SURVIVAL OF NATIVE GRASS SPECIES IN THE CENTRAL AND SOUTHERN GREAT PLAINS, 1935. U. S. Dept. Agr. Tech. Bul. No. 549, 55 pp., illus.
- (26) Savage, D. A.
1939. GRASS CULTURE AND RANGE IMPROVEMENT IN THE CENTRAL AND SOUTHERN GREAT PLAINS. U. S. Dept. Agr. Circ. No. 491, 56 pp., illus.
- (27) Snapp, Roscoe R., M.S.
1930. (Rev.) BEEF CATTLE Their Feeding and Management in the Corn Belt States. John Wiley & Sons, Inc., New York, Chapman & Hall, Ltd., London, 494 pp., illus.

- (28) Slagsvold, P. L.
1936. READJUSTING MONTANA'S AGRICULTURE VI. Montana's Irrigation Resources. Mont. Agr. Expt. Sta. Bul. No. 315, 18 pp., illus.
- (29) Slagsvold, P. L.
1937. AN ANALYSIS OF MONTANA FARM PRICES. Mont. Agr. Expt. Sta. Bul. No. 345, 78 pp.
- (30) Starch, E. A.
1935. ECONOMIC CHANGES IN MONTANA'S WHEAT AREA. Mont. Agr. Expt. Sta. Bul. No. 295, 70 pp., illus.
- (31) Starch, E. A.
1936. READJUSTING MONTANA'S AGRICULTURE VII. Montana's Dry-Land Agriculture. Mont. Agr. Expt. Sta. Bul. No. 318, 19 pp., illus.
- (32) Tootell, R. B.
1937. RANGE CONSERVATION AND FARM CREDIT. Paper presented Western States Extension Conference, Spokane, Wash., May 25, 1937, 9 pp.
- (33) Tootell, R. B.
1937. A DISCUSSION OF THE PAPER RESEARCH, TEACHING, AND EXTENSION IN RELATION TO FARM CREDIT. Federal Land Bank of Spokane, Wash., 3 pp.
- (34) Tootell, R. B.
1938. THE INTEREST OF THE FEDERAL LAND BANK IN THE WESTERN RANGE PROBLEM. Paper Presented to the Northwest Scientific Ass'n at Spokane, Wash., Dec. 29, 1938. Federal Land Bank of Spokane, Wash., 12 pp.
- (35) United States Forest Service
1937. RANGE PLANT HANDBOOK. U. S. Dept. Agr., U. S. Govt. Printing Office, Wash., D. C., 1046 pp., illus.
- (36) Weaver, John E., Clements, Frederic E.
1938. PLANT ECOLOGY. McGraw-Hill Book Co., Inc., New York and London, 601 pp., illus.
- (37) Westover, H. L., Sarvis, J. T., Moomaw, Leroy, Morgan, George W., Thysell, John C., Bell, M. A.
1932. CRESTED WHEATGRASS AS COMPARED WITH BROMEGRASS, SLENDER WHEATGRASS, AND OTHER HAY AND PASTURE CROPS FOR THE NORTHERN GREAT PLAINS. U. S. Dept. Agr. Tech. Bul. No. 307, 36 pp., illus.

- (38) Unpublished Data of the Dept. Agr. Econ.
Montana State College, Bozeman, Mont.

Other Literature Used But Not Cited

1. AGRICULTURAL STATISTICS
1938. U.S.D.A., U. S. Govt. Printing Office, Wash., D. C. 544 pp.
2. FEEDS AND FEEDING, A Handbook for the Student and Stockmen. F. B. Morrison
1933. Twentieth Edition, Unabridged, The Morrison Publishing Co., Ithaca, N. Y., 1050 pp., illus.

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