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Title THE ECONOMIC FEASIBILITY OF UTILIZING IRRIGABLE WILLAMETTE VALLEY FLOOR LAND FOR BEEF PRODUCTION

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The purpose of this study was to test the economic feasibility of utilizing less well drained irrigable Willamette Valley floor soils for beef production.

Basic data for the study were obtained from a survey of beef producers in the study area. These data were combined with related data obtained from published and unpublished sources. From the combined data, 11 budgets covering eight basic systems were structured to represent typical receipts and expenses that would be reasonably expected from each basic beef production system or modification thereof.

The eight basic systems tested were: (1) cow-calf, (2) cow-yearling, (3) cow-yearling, yearlings finished for slaughter, (4) feeders purchased in the fall, wintered, and pastured, (5) same as (4) except feeders finished for slaughter, (6) feeders purchased in

the spring and pastured, (7) same as (6) except feeders finished for slaughter, and (8) feeders purchased in the fall, wintered on a full feed roughage ration, marketed as heavy spring feeders, or finished for slaughter.

Analysis of the budgets, as structured, shows that beef production systems requiring maintenance of a breeding herd are characterized by highly negative net returns to management. The negative net returns are attributed primarily to the low number of pounds of beef turned off per acre and its value relative to the large amounts of feed and other input costs required to maintain the breeding herd. The cow-calf and cow-yearling systems, as budgeted, would turn off 268 and 421 pounds of marketed weanling and yearling beef per acre respectively.

All budgeted systems in which forage and/or pasture supply the primary feeds are also characterized by negative returns. Amounts of beef turned off per acre range from 611 to 1002 pounds for the systems in which stocker cattle are purchased and fed on roughages and/or pasture. While the levels of output are reasonably good, the typical negative differential between purchase prices and selling prices prohibits these systems from showing positive net returns above all costs. Based on 1958-64 Portland market reports, purchase prices of stocker and feeder cattle average about 24 cents per pound compared to selling prices of about 20 cents per pound for

heavy grass fed cattle. Budgeted total costs per pound of beef marketed average 22 to 23 cents.

Positive net returns are indicated for systems in which feeder cattle are purchased and finished for slaughter after feeding them on roughages and/or pasture. Average prices for finished cattle are approximately equal to purchase prices, thus eliminating the negative margin between purchasing and selling prices.

The size of herd required to provide a reasonable degree of operating efficiency was set at 200 cows. Based on typical yield data for the soil series included in the study, 242 acres are necessary to supply the amount of forage required. For comparative purposes, the number of cattle for each budgeted system is designed to correspond to a 242 acre farm.

If input-output relationships, cost-price ratios, and other conditions obtained by individual producers are more favorable than those typified in these budgets, the economic prospects for future expansion of beef production in the Willamette Valley would be enhanced.

THE ECONOMIC FEASIBILITY OF UTILIZING IRRIGABLE WILLAMETTE VALLEY FLOOR LAND FOR BEEF PRODUCTION

by

WILLIS EARL MIDDLEMISS

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THE ECONOMIC FEASIBILITY OF UTILIZING IRRIGABLE WILLAMETTE VALLEY FLOOR LAND FOR BEEF PRODUCTION

INTRODUCTION

The Willamette Basin covers an area of about 11,600 square miles or 12-1/2 percent of the State of Oregon. About two-thirds of the state population resides in the Willamette Basin. The distribution of annual rainfall in the Valley, as typified in Figure 1, is such that the summer period of greatest crop need is also a period of very low rainfall. Thousands of acres of valley floor land are potentially irrigable and adequate water resources are available to facilitate the irrigation of this land. Expansion of agricultural production in the basin is dependent upon development of water resources for irrigation.

While physical expansion in production of presently grown cash crops such as bush beans, berries and seed crops could take place with irrigation, demand for such crops is limited. Barring innovations that completely alter existing area competitive relationships, it is not easy for one production area to greatly increase its share of the market. Expansion cannot be expected to affect cost structure sufficiently to achieve any advantage on the cost side of the equation and thereby improve the area's competitive position with a lower price. Markets become unfavorable with respect to price when

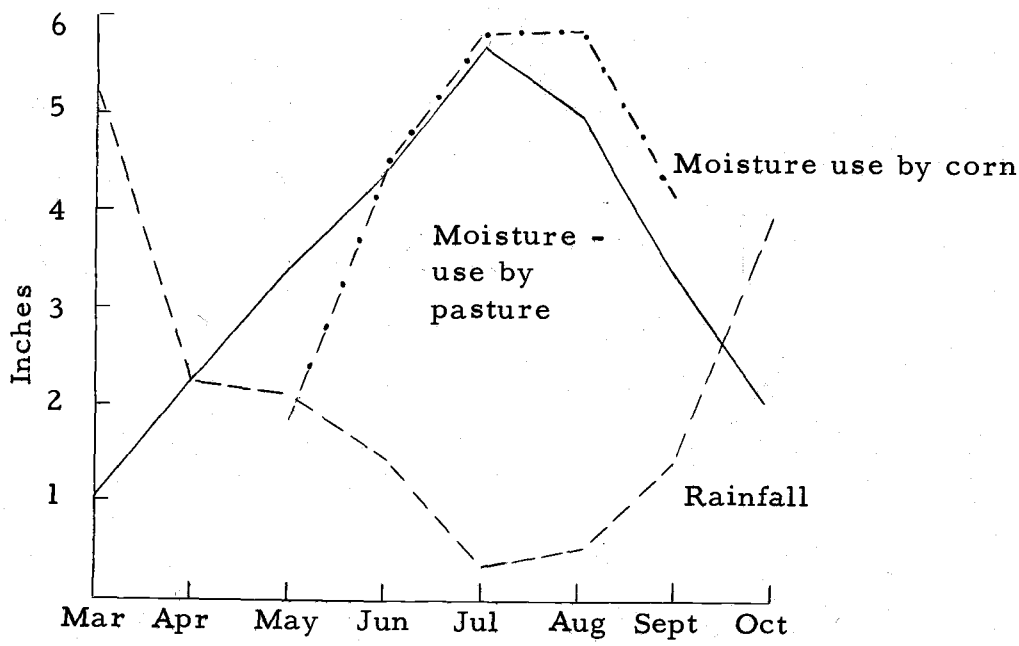

Figure 1. Precipitation and Crop Moisture Requirements--1962 Growing Season.

Total rainfall April 1 - Sept. 30 = 8.09 inches.
Total moisture use by corn May 1 - Sept. 30 = 22.04 inches.
Total moisture use by pasture April 15 - Sept. 30 = 26.54 inches. (19)

production exceeds normal demand. Thus any sizable scale of irrigation expansion in the Willamette Valley must be based on an increasing amount of land being utilized for forage production.

What does this imply? Forage production generally is associated with livestock as a means of converting it into meat or milk for human consumption. Dairying could be expanded tremendously with increased forage production. However, market demand limits the quantity of dairy products which can be sold at reasonable prices. Furthermore, production per cow has been increasing quite rapidly through technological advancement so that production can increase without utilizing more forage. Dairying can be expected to expand only in proportion to population growth. Limitations also prevail when sheep production is considered. A separate study would be necessary to determine the potential for sheep production on the Valley floor under irrigation.

The long time trend of increasing per capita consumption of beef is expected to continue in the United States. Furthermore, Oregon does not produce enough slaughter beef to meet the demands of its consuming population. A hypothesis is therefore extended that large scale expansion of irrigation on the valley floor cannot take place at the present time, unless it is economically feasible to produce beef cattle as a means of utilizing the forage that would necessarily be produced.

It is the purpose of this study to consider the feasibility of beef production as a means of utilizing the less well drained valley floor land under irrigation.

OBJECTIVES

The major objective of this study is to evaluate the economic feasibility of beef cattle as a major enterprise for utilizing the less well drained irrigable Willamette Valley floor land resources. As a means of testing the feasibility of beef cattle, the following production systems are analyzed:

1. Cow-calf operation with calves sold in the fall as weaners.
2. Cow-long-yearling operation with calves being wintered, pastured through the summer and sold off grass in the fall.
3. Same as 2 except that yearlings would be short-fed for slaughter.
4. Calves purchased in the fall, wintered, pastured and sold off grass in the fall.
5. Same as 4 except animals would be short-fed for slaughter.
6. Calves purchased in the spring, pastured and sold off grass.
7. Same as 6 except short-fed for slaughter.
8. Calves purchased in the fall and wintered on full feed on corn silage, grass legume hay and protein supplement, with an option of selling as heavy spring feeders or short feeding for slaughter.

An attempt is made to determine whether expected returns under normal conditions and management are sufficient to allow beef production to favorably compete with alternative land uses under irrigation. The scale of operation necessary to provide an income sufficient to meet the moderate living needs of a normal farm family is a controlling factor.

METHODOLOGY

A study of this nature poses many problems in choosing methods of procedure. Variation occurs among farms and farmers. The less well-drained valley floor soils are not homogeneous in character and individual farms are usually made up of several soil series. Existing size of holdings is not equal; cattle vary in size, quality and inherited ability to convert feed into body growth and weight; operators vary in their management ability and techniques and in their ability to adapt to new or different circumstances. Furthermore, not all systems of beef cattle production deemed to need testing under altered conditions are currently to be found in the area. For some systems only one or two observations exist. The nature of the problem prohibits adherence to statistical techniques. For these reasons it has been necessary in approaching this problem to structure budgets as a means of analyzing the feasibility of the enumerated beef production systems.

County agents in the survey area provided a list of beef producers from which to draw a sample. Producers who did not belong to the defined population were eliminated from the list. The remaining population was too small to merit stratification for sampling. All producers in the remaining population, with whom arrangements could be made, were interviewed individually or in groups. From their operations and experiences, 28 beef producers and three county

agents in the survey area provided input-output data along with crop and livestock practices employed in beef production. These data are combined with data obtained from Oregon State University Soils, Farm Crops, Agricultural Engineering, and Animal Science Departments and related references to synthesize and budget models of the enumerated beef production systems which are analyzed later. When applicable, utmost effort is made to emulate the production patterns and practices typical of beef producers in the Willamette Valley. Performance rates and production practices are discussed in following sections.

Cattle of a quality that will produce good and choice market grade feeder and slaughter beef are used for structuring all models. Forage produced on the farm is charged to the cattle at production cost exclusive of labor. Labor is charged as a separate item. Purchased forage is charged to the cattle at delivered price. For all models except the full feed roughage system, grass-legume hay has been used as the only roughage. Silage or other roughage could be substituted for the hay as long as an equal amount of hay equivalent were substituted.

Current representative prices have been applied to the combination of physical input-output data assembled to synthesize models for each production system. The method of determining the level of most budget items is shown in the appendices.

Each budgeted model is explained by sufficient text to detail the basis of the model, interpret the results shown, and point out possible modifications.

BASES FOR SYNTHESIZING MODELS

Major items which combine to serve as the foundation for synthesizing all models are detailed under separate subheadings in this section.

Review of Related Literature

Method of study, budget approach, and analysis of the beef production systems in this study closely parallel those found in a recent economic study of typical beef production systems in the Macon Ridge Area of Louisiana (20). Other literature relating to this feasibility study is briefly reviewed.

Production conditions vary greatly throughout the country. At best much of the available literature relating to beef production can serve only as a general guide, if applicable at all, to beef production in the Willamette Valley. Economic literature pertaining to the feasibility of beef production on irrigated farms in the Valley is indeed limited.

A recent article in Western Livestock Journal (1, p. 53) presented the following feed efficiency table (Table 1) and discussion.

In general, roughage contains about 50 percent TDN and concentrates 75 percent. A brood cow requires approximately 4500 pounds of TDN per year. If she weans a 450 pound calf the efficiency is 1:10.

The cow-yearling system is more efficient than the cow-calf because the maintenance cost of the cow is charged against her offspring. In the yearling system, the same total weight can be produced with fewer cows; therefore, less feed is tied up in maintenance of the cow herd. The table also shows that the efficiency of yearlings decreases at a rapid rate as the animal increases in size. It is noted also from the table that the efficiency of creep feeding is relatively low. It takes nearly ten pounds of creep feed for each additional pound of calf gain. At 2.5 cents per pound this is a feed cost of 25 cents per pound of calf gain.

Table 1. Efficiency of Gain (Lbs. TDN/lb. gain)

	Efficiency
Cow with 450 lb. calf	10.0
Creep feeding	6.7
Calves (400 lb)	3.5
(600 lb)	4.6
Steers (800 lb)	5.1
(1000 lb)	6.8
(1100 lb)	7.7
Pig	2.8
Broiler	1.5

One irrigated pasture trial by the Oregon Agricultural Experiment Station near Corvallis (11,p. 14-15) with 86 steers resulted in production of 479 to 810 pounds of beef per acre. Pastures were well

fertilized and 19 inches of water per acre were applied in six sprinklings between June 19 and September 28. Fifteen acres of Ladino-grass pasture carried 54 head early in the season with numbers being reduced gradually to 24 head by September 30. Grazing on 15 acres of grass pasture dropped from 32 head to 12 in the same period. Ladino-grass pasture yielded approximately one ton of silage and five tons of pasture forage for a total of 6.08 tons of cured hay equivalent per acre. The grass pasture produced 1.61 tons of silage and 3.21 tons of pasture forage for a total cured hay equivalent of 4.82 tons. Ladino-grass pasture turned off 810 pounds of beef per acre from April 22 to September 30 while straight grass pasture turned off 479 pounds. Steers on Ladino-grass gained an average of 1.55 pounds per day as compared to 1.34 pounds per day for the all grass pasture.

After September 30 the animals were split into three lots with the following results: Those left on pasture with no supplemental feeding until November 3 lost an average of 1.43 pounds per head per day; Cattle on pasture plus eight pounds of chopped barley per head per day gained 0.25 pounds per head per day; The group on eight pounds of grain and 25 pounds of grass silage per head per day averaged 1.13 pounds of gain per head per day. The group on pasture was necessarily slaughtered earlier and animals graded mostly commercial. Both other groups graded mostly good. Some of the weight loss in the latter part of the grazing season was attributed to stomach

worms.

A four-year irrigated pasture trial in Klamath County (12, p. 7) measured gains of 500 to 740 pounds of beef per acre. Average production from five different grass-legume mixes for the four-year period was 565. 2 pounds per acre. Average daily gains for these pastures for this period was 1. 64. Percent legume ranged from 33 to 50 percent with an average of 38. 2 percent. Cattle were grazed 112 to 120 days beginning May 15 to June 1.

A feeding experiment at Prosser, Washington (3) provides data regarding the effects of winter gains on subsequent gains on irrigated pastures. Hereford calves grading low good and averaging 518 pounds were randomly assigned to three different nutrition levels near the end of November for 155 days of winter feeding. Average daily gains on the high, medium, and low wintering treatments were 1. 29, 1. 01, and 0. 33 pounds, respectively. Feed costs per pound of gain were 13. 15, 13. 85, and 34. 75 cents for the high, medium, and low treatments, in that order. Costs were based on per ton feed prices as follows: alfalfa hay $20, Corn silage $10, and dried beet pulp $40. Average daily gains on pasture were 1. 89, 1. 91, and 2. 45 pounds, again in the high to low treatment order. The low winter nutrient treatment produced lower marketing weights thus showing that the effects of lower treatment were not overcome by subsequent pasture or drylot gains. The high and medium treatment animals made

average daily feedlot gains of 2.23 pounds in 54 and 57-day feedlot periods, respectively. Low treatment animals averaged 1.96 pounds per head per day for a 51-day feedlot period.

Animal scientist A. T. Ralston (15) has stated that 400 to 800 pound calves require 4.5 to 5 pounds of TDN per pound of gain while 900 pound animals require 6.5 to 7 pounds. Young grass or grass-legume forage may run 75 percent TDN while old mature forage (comparable to straw) may run only 30 to 35 percent TDN on a dry-matter basis. Animals will graze about the same number of hours per day regardless of whether forage is good or poor. Feeder animals may consume 32 pounds of dry matter per head per day on thick lush pastures 8 to 12 inches high with 4 to 5 thousand pounds of dry matter per acre. Poor pasture late in the season with only 1100 pounds of dry matter per acre may result in animals consuming only ten pounds of dry matter per day, barely a maintenance requirement.

Cattle confined to lots and full fed on good silage could be expected to gain 1 to 1.5 pounds per head per day according to John Landers (8). Landers also stated that calves should weigh at least 450 pounds to utilize large quantities of silage. If a few pounds of grain were fed with silage, animals should gain two pounds per head per day. Richards and Korzan (16, p. 11, 31) assumed 2.75 pounds per head per day as reasonable average feedlot gain on a fattening ration in Oregon. Thus it would take 150 days to feed a 650 pound

feeder steer to slaughter weight of 1062. 5 pounds. A feed conversion ratio of 8. 5 was used to arrive at a requirement of 23. 375 pounds of feed per day.

Richards and Korzan state that if a portion of the feedlot is hard-surfaced (i. e., concrete aprons at feed bunks, water tanks, etc), it is generally recommended that 180 to 225 square feet of loafing space per animal be provided. For hard-surfaced lots 50 to 100 square feet per animal is recommended. Without hard-surfacing more than 225 square feet per animal may be required.

Survey Area

The selected survey area which comprises Benton, Polk, and Linn Counties is located in the central portion of the Willamette Valley of western Oregon. Crops, soils, climatic, and economic conditions are similar to those found throughout the entire valley. Soils found in the Willamette catera characteristically range from highly fertile and well drained to infertile and poorly drained. The less well drained Woodburn, Amity, and Dayton series comprise a large portion of the valley floor soils. This feasibility study pertains primarily to the kind of soils possessing characteristics generally associated with these series. Only a sprinkling of the better drained Willamette soil series is commonly found in the valley floor complex considered in this study.

Soil Productivity

Forage yields budgeted in this study are based on obtained survey data without differentiation with respect to soil series. Prior to obtaining field data, it was hypothesized that significant differences in productivity existed between poorly drained Dayton soils and other less well drained valley floor soil series. If so, stratification into two categories according to productivity would have been necessary. However, data obtained did not indicate a significant difference in yields of irrigated pasture and forage crops. Other factors such as variability in fertility and management techniques appeared to have equal influence on yield differences. Differences between soil series could not be readily distinguished from variations within series. One exception was corn silage yields where the arithmetic average yield was 18 tons per acre on Dayton soil and 21 tons per acre on Willamette, Woodburn, and better Amity soils.

Size of Operation

Any system of beef production employed must be of sufficient size to achieve a reasonable degree of operational efficiency with respect to use of required machinery and available operator's labor. Upon evaluating the survey data, it became apparent that for the cow-calf system a herd size of about 200 cows is necessary to attain a

reasonable degree of operational efficiency. Smaller herds would normally fail to meet this efficiency qualification. Based on this finding, the size of synthesized cow-calf models structured for feasibility analysis is set at 200 cows. This size of cow herd is equated with typical forage yields for the less well drained valley floor soils to determine the amount of land resources needed. All required summer and winter forage being produced on the farm, 242 acres is thereby derived as being the necessary farm size for the cow-calf livestock complex.

Models for all beef production systems enumerated earlier are structured on the basis of holding the above acreage constant for comparative purposes. Numbers of cattle in each model are scaled to fully utilize the forage produced on a 242 acre farm seeded to pasture and hay, in a kind of beef production program involving roughage as the primary feed. Models requiring a finishing period following roughage feeding are based on the assumption that the necessary additional roughage would be purchased from other farmers in the locality. The number of cattle finished corresponds to the carrying capacity determined by the prefinish forage utilizing program.

Cattle Prices

The purchase and sale of cattle required for specific models are priced in accordance with the average prices of specified classes

and weights of cattle by months (Appendix I), as reported by the Portland, Oregon market, for the 1958-64 phase of the recent cattle cycle. Prices reached a peak in 1958 and declined to a low in 1964. An average price over this period represents the average price a producer might expect over a complete cattle cycle, with the general price level at approximately current readings. Where number of heifers reported was not sufficient to set a representative price, heifer prices are interpolated from other market class steer-heifer price differentials.

Death Loss and Shrink

Normal death loss and market shrink are compensated for in each model by reduced rates of gain and corresponding market weights, rather than by reduced cattle numbers. No allowance is budgeted for any salvage value that might accrue from animals that die. When death is attributed to causes such as bloat, it is sometimes possible to salvage the carcass, provided the animal is bled and butchered immediately.

Transportation

Transportation charges associated with buying and selling have been included as cash expenses at commercial rates. The rates were obtained from the Public Utilities Commission in Salem.

Charges are based on a point to point rate of 23 cents per hundredweight for 18 thousand to 28 thousand pounds load size from Salem to Portland, plus a four cents per hundredweight point to farm rate for hauling from a farm within 15 miles of the Salem point. This constitutes an almost absolute minimum transportation charge for any producers in the counties selected as the survey area to which the study applies. Point to point rates from Corvallis and Eugene to Portland are 36 cents and 42 cents respectively.

Pickup, Truck and Car Expenses

Producers interviewed for this study indicated the need for a pickup and a one and one-half ton truck, as well as using the family car for a portion of their farm business (Appendix A). A wide range in required annual miles of use of these vehicles was found to prevail. Considerable variation is to be expected with varying distances from town and kinds of livestock operation. The vehicle mileage charge (Appendix A) budgeted for each model in this study is designed as a representative expense allowance for this vehicle complex. Total annual mileage may be quite different from the average one thousand miles per month used as a combined base mileage allowance. Mileage for each vehicle may be considereably higher or lower than the proportioned allowances used for computation purposes. However, fixed costs representing such items as depreciation, license fees and

and insurance coverage, remain essentially unchanged regardless of total annual miles driven. Operating expenses for fuel, oil, tires and repairs are proportional to miles driven. Thus total cost per mile (14) increases as number of miles driven is decreased and vice versa. With fixed costs being considerably more important than variable costs, it follows that total annual costs of operating these owned vehicles does not change appreciably with changes in total miles driven or proportion of total mileage for which any one vehicle is used. Operators would normally haul larger loads rather than making proportionately more trips as cattle numbers increase. Hence this item is held constant in all models constructed.

Allowance is made in the models for commercial hauling of cattle except for bulls purchased. Purchased feed is budgeted at on farm delivered price. However, the small truck will be used for various purposes such as hauling hay from the field, and taking small numbers of animals to market at other than regular marketing dates. On occasions when the operator has time available, he may elect to haul all or part of his purchased feeds. The individual operator must decide whether any item of equipment is used enough to economically justify its ownership.

Buildings and Housing

Free stall housing is the basic type budgeted in structuring all

models which require housing. This kind of housing was observed to be working satisfactorily for one producer interviewed for the study. It is recommended by university extension agricultural engineer Mike Huber (5), as being the least expensive kind of suitable housing for cattle operations in the Willamette Valley where cattle must be protected from winter rains and mud. The necessary housing facility for any new beef operations arising out of expanded irrigation of valley floor land will likely have to be newly constructed. This being a feasibility study, and considering the above assumption, it seems appropriate to use free stall housing in synthesizing the ensuing models. Figure 2 depicts a possible arrangement for the cow-calf system. A four inch layer of rough surface concrete comprises the lot area. Feed bunk space of approximately two linear feet per animal is built into the feed storage in the center and is included in construction costs (Appendix F). Eight foot openings are provided at approximately 100 foot intervals in the front row of stalls to allow free cattle movement and facilitate convenience in cleaning the lot. A lengthwise slope of three percent allows liquid waste to escape. Much of the solid manure will also wash off the lot during rains so that cleaning is minimized. Operators using this kind of housing generally go through the stalls once each day with a fork or shovel to remove any droppings which may be found inside the stalls.

Bedding in the form of sawdust, shavings, or similar material

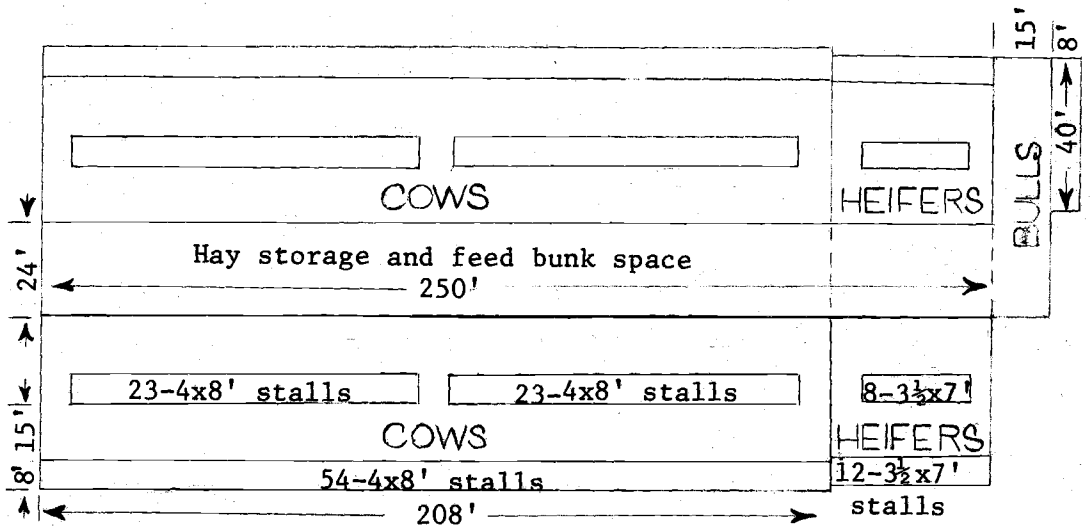

Figure 2. Possible Free Stall Housing Arrangement For Cow-Calf Operation - 200 Cows.

is added to the stalls periodically when needed as described in Appendix F. A firmly packed soil base is recommended in the stalls to minimize the hollowing out tendency which occurs when animals bed down. Keeping the bedding level with the surfaced lot will minimize the amount of droppings found inside the stalls.

Value of Manure

No satisfactory method could be found to readily determine the value of manure resulting from feeding cattle under surfaced lot free stall circumstances. The one producer using this confinement system reported detectable increases in crop production where manure was spread. This indicates a value of manure at least equal to the handling expenses involved in cleaning the lot and hauling to the field. With no other valid data available, it is assumed in the models that the value of manure is equal to the cost of handling the amount produced. Hence in all budgets manure is entirely excluded from charges or credits itemized.

Machinery and Equipment Needs

Listed in Appendix A is the necessary complement of machinery and equipment reported by beef producers surveyed as being necessary for operating a farm on which beef is the primary enterprise. Equipment items listed are complementary to a medium size two or three

plow tractor. Number of operators reporting whether they would own or rent the items listed is included. Some operators would own a cheaper second tractor.

A majority of the operators interviewed for this study reported they would hire custom baling done rather than owning a baler. If silage were to be harvested in place of hay, a field chopper and blower would be needed. A cultivator and rod weeder might also be required if corn were grown for silage. If comfinement feeding of silage or concentrate feeds is practiced, a feeder box wagon is needed unless automatic feeding is employed. Some operators prefer to use a swather in place of a mower and rake for haying purposes where the quantity of hay is of sufficient magnitude to merit the use of such an expensive item. Hay will cure much faster when cut with a swather with a crimper attachment. All operators indicated that livestock scales would be desirable, although only one producer was using them.

At new prices a total investment of $18, 000 to $24, 000 represents the amount that must be typically invested in machinery and equipment to operate a livestock production unit of the type and magnitude outlined.

Irrigation

Sprinkler irrigation is the method budgeted throughout this

study. In order to effectively irrigate by surface methods, land must be carefully leveled to prevent missing high spots and avoid puddling and drainage problems in depressions. This latter problem is especially critical for the less well drained valley floor soils considered in this study. Initial costs of proper leveling and development of a surface irrigation system are often equivalent to those of installing a sprinkler system. It is difficult to keep land well leveled and costs of necessary releveling often are as high or higher than operating the sprinkler system over time. It should also be realized that skillful surface irrigators are difficult to find and that spots where deep cuts are made are likely to be low in fertility and thus produce very little. Based on these factors plus empirical observation, it is the feeling of extension irrigation specialist Marvin Shearer (18), that most future irrigation systems developed in the Willamette Valley will be of the sprinkler type. Of course, if land were sufficiently level and well drained to facilitate efficient surface irrigating more economically than sprinkling, the decision to use sprinklers would be based on other than economic criteria.

Irrigated Pasture

For good production on the less well drained acid soils included in this study, adapted plant species must be grown. The seed mixture planted by producers interviewed was found to be generally

consistent with the recommendations of their county agents and the University Farm Crops Department. A typical planting mixture consists of two pounds of white clover and 15 pounds of rye grass or tall fescue, or a combination of these grasses with the clover. Such pastures could be expected to consist of one-third to one-half clover.

Costs of establishing pasture are shown in Appendix C. Some variation could naturally be expected due to differences in individual farm situations. Lime needs constitute the largest single variable factor. From 0 to 2-1/2 tons per acre are required at a cost of about $14 per ton.

By following reasonably good management practices producers reported pastures normally remain in good productive condition for 5 to 20 years. An average productive life of eight years is budgeted in this study.

Fertilizer varied considerably in both analysis and amount applied per acre. For budgeting purposes 300 pounds of 16-20 per acre per year, in two applications, represents the quantity and quality of fertilizer applied. Soil tests are recommended to determine specific fertilizer needs for individual pastures.

Pastures were reportedly irrigated 5 to 11 times per year depending on management, dryness of the season, soil conditions and frequency of changing sprinklers. For purposes of structuring models, eight irrigations at 10 to 14 day intervals beginning in May

are considered necessary during a normal growing season.

Average grazing season usually begins around April 15 and continues until November 1. This allows six and one-half months or 195 days of grazing. On poorly drained Dayton soils turn-in date may necessarily be delayed until June 1 and cattle may have to be removed as early as October 1 due to wet conditions. It becomes necessary to remove a hay or silage crop from such land before turning cattle on it. Pastures are often washy early in the grazing season and also tend to be low in nutrient content late in the season. After August 1 to 15 feeder cattle on pastures often fail to make satisfactory rates of daily gain without supplemental feeding. Many producers follow the practice of harvesting a hay or silage crop off part of their pasture during the vigorous spring growth period. Such feed is then fed to the cattle later in the season when the pasture will no longer support them. Such practice facilitates maintaining a constant herd size throughout the pasture season and is incorporated in structuring ensuing pasture utilizing production models. Only about one-third of pasture productivity takes place after August 1 (9). Production slumps during the hotter days of July and August and grasses again increase their growth in September as weather becomes cooler. Hence, for synthesizing ensuing beef production models, 1.75 tons of hay per acre is harvested from one-third of the pasture acreage in early spring. This hay is then assumed to be fed to the cattle when

pasture productivity declines appreciably.

A two ton hay crop is considered as being harvested from pasture rather than allowing grazing during the establishment year. This allows the plants to become well established without damage from tramping and pulling out plants that have not yet developed an adequate root system to withstand grazing. Thus, on the average, irrigated grass-legume pastures can be grazed for seven years on the less well drained valley floor soils. Carrying capacity is normally highest during the earlier years of production. Nearly all operators reported clipping established pastures at least once or twice during the season to remove stems and old growth. New growth and increased productivity is thereby encouraged. While nearly all producers expressed the feeling that harrowing is a good practice, only 20 percent of those interviewed actually practice dragging their pastures to scatter droppings.

Described pasture practices found to be common among beef producers, along with recommendations from the Department of Farm Crops, have been incorporated in synthesizing models for all beef production systems using pasture.

Irrigated Hay

Hay production practices on the less well drained valley floor soils closely parallel those for pasture production (9). The same

grass-legume seed mixture is characteristically planted for hay. Seven years of production after the establishment year can be expected. Fertilizer and irrigation requirements are the same as for pastures. An all-legume hay can be produced on these soils by planting lotus (birdsfoot trefoil) of the small leaf species. Lotus has the advantage of requiring less frequent irrigation (21 days) than grass-clover (12 days) due to its deeper root system. Either kind of hay can be expected to yield an average of five tons per acre in three cuttings. For beef cattle operations, grass-clover hay has the advantage of providing greater flexibility in the program inasmuch as it can be grazed rather than cut for hay without subjecting cattle to potential bloat.

BUDGETS OF SELECTED PRODUCTION SYSTEMS

Structured in this section are models of the beef production systems selected for feasibility analysis.

Budget 1 - Cow-Calf System, Calves Sold at Weaning

A total of 200 grade cows constitutes the basic production enterprise for which a necessary complement of bulls, replacement heifers, feed, machinery, and land is budgeted. A ratio of 25 cows per bull is maintained for this model. Producers interviewed were using ratios of 20 to 35 cows per bull. Most operators were using registered bulls in an effort to upgrade their cattle. Due to the expense of carrying non-producing animals, heifers are characteristically calved as two year olds. According to survey data, it is reasonable to expect heifers to remain in the cow herd to produce an average of seven calves. Some may remain in the herd to produce as many as ten calves or more. Others will be culled after one or two calvings.

When palpated, any cow or replacement heifer detected as not being pregnant is considered to be immediately culled and sold. According to Ralston (15), about five percent of the older cows and 25 to 30 percent of the replacement heifers could be expected to fall into this category. Twenty-eight of the best pregnant replacement heifers

are selected from the initial 40 to replace older cows that have died or been culled. Starting with 100 percent of the breeding herd being pregnant in the fall, it is considered that a 95 percent calf crop is weaned and marketed the following October or early November. Calves are assumed to average 425 pounds per head net marketed weight. A 20 to 25 pound weaned weight differential between steers and heifers is allowed in budgeting. Bulls are considered to be purchased at breeding age and used through three breeding seasons. An outstanding bull may be kept longer than this. However, bulls kept for longer than three seasons tend to become too heavy and lazy to service the cow herd in a limited breeding season. Also, if run together, there is a tendency for older and younger bulls to fight rather than effectively perform the breeding service.

Cow death losses can be expected to average near one percent annually. In the cow-calf budget, two cows and one replacement heifer are budgeted to be lost to this factor.

Expected carrying capacity of improved irrigated pastures adapted to the less well drained soils found to prevail in the study area is typically one and one-half cow-calf pairs, one bull, or two and one-half yearlings per acre. A yearling approximates 0.6 cow-calf units. For 200 cows, 8 bulls, and 40 replacement heifers 242 acres are thus required when winter hay needs are produced on the farm. Based on typical carrying capacity, this combination of cattle

requires 177 acres of pasture, 20 of which is new seeding. While it is not grazed, two tons of hay per acre are considered to be produced on new seeding. Sixty-two acres of hay are needed, assuming yields of five tons per acre from 54 acres of established hay and two tons per acre from eight acres of new seeding. The remaining three acres are allowed for the farmstead. It is recognized that most actual farm situations in the Willamette Valley will be partially comprised of hills, timber or waste land. In such instances a producer must evaluate the farm to determine whether it is equivalent in productivity to the kind and quantity of land described herein. The value of the less well drained valley floor soils is found to average about $275 per acre, except where particular location may affect the price. This value is for the land itself, exclusive of the sprinkler system and farm improvements.

In the cow-calf budget hay is charged against the cattle at production cost (Appendix D). For winter feeding one pound of cottonseed meal per head per day is fed to pregnant heifers and fall weaned replacement heifers. Pregnant heifers receive three pounds of rolled barley per head per day during the last four months of winter pregnancy. Grain is considered necessary to provide sufficient carbohydrates in the ration to sustain the continued growth of heifers while producing a strong calf.

On the basis of input-output relationships used in this budget

Budget 1. Cow-Calf System, Calves Sold at Weaning

200 Cows	Units	Unit Price	Total	Per Cow
Cash Receipts				
95 steers	435 lbs	$. 2415	$9,980	$ 49.90
55 heifers	415	. 2200	5,022	25.11
11 yrlg cull replacement heifers	850	.1850	1,730	8.65
26 cull cows	1000	.1491	3,877	19.38
2.6 cull bulls	1500	.1922	750	3.75
	TOTAL CASH RECEIPTS		$21,359	$106.79
Cash Expenses				
Feed: * (Appendix H)				
Hay	325 T	$11.19	$ 3,637	$ 18.19
Cottonseed meal	5.6	80.00	449	2.25
Barley	5	52.00	262	1.31
Salt	3	48.00	144	.72
Mineral	1.1	87.00	96	.48
Pasture*	157 A	42.95	6,743	33.72
		Total feed	$11,331	$56.67
Bull replacement	2.6 hd	$425.00	1,105	5.53
Marketing	(3-1/2% of gross cattle sales)		748	3.74
Veterinary-medical supplies			600	3.00
Taxes:				
Land	242 A	$ 5.50	1,331	6.66
Buildings		(Appendix G)	165	.83
Cattle		(Appendix G)	627	3.14
Insurance		(Appendix F)	69	.35
Transportation	1034 cwt	.27	279	1.40
Repairs on buildings		(Appendix F)	83	.42
Utilities			120	.60
Bedding		(Appendix F)	150	.75
Overhead			200	1.00
Pickup, truck, car expenses*		(Appendix A)	1,540	7.70
Fence maintenance			150	.75
	Total operating capital		$18,498	$92.54
Interest on operating capital (2%)		(Appendix G)	370	1.85
	TOTAL CASH EXPENSES		$18,868	$94.39
CASH RECEIPTS - CASH EXPENSES			$ 2,491	$12.46
Non-cash Expenses				
Interest on investment:				
Land	242 A	$ 13.75	$ 3,328	$16.64
Cattle housing & hay storage		(Appendix G)	501	2.51
Cattle		(Appendix G)	2,400	12.00
Depreciation		(Appendix G)	668	3.34
Operator's labor			4,800	24.00
	TOTAL NON-CASH EXPENSES		$11,697	$58.49
RETURN TO MANAGEMENT			-$ 9,206	-$46.03

*Includes non-cash expenses on machinery, equipment, and motor vehicles and storage for these items.

and price-cost ratios as indicated, the cow-calf operation fails by $9, 206 to meet total operating expenses--cash and non-cash. If the operator ignores the non-cash expenses of interest and depreciation and considers his labor as having no value, income exceeds expenses by $2, 491. If indebtedness were outstanding on the land, buildings, and/or cattle, interest on the amount of debt would become a cash expense to shrink this amount. To provide a break-even return to management, the price of calves must be $14. 35 per hundreweight higher than the seven-year October-November price used in the budget. This necessary price increase could be partially offset by weaning heavier calves at no extra cost and/or obtaining higher prices for cull animals. An additional cent per pound above the break-even price would provide a return to management of $6, 415. This amount becomes comparable to returns commonly attained in other businesses.

Net marketed weaning weight totals 64, 150 pounds. Total expenses minus receipts from cull animals amount to $24, 208. Thus, cost per pound of weaned beef marketed is 37. 74 cents. An average of 268 pounds of weaned beef per acre is marketed from the 239 acres of producing land. In the production system outlined, annual cash expenses per brood cow total $94. Total expenses per cow amount to $153 while total receipts per cow are only $107. Thus, based on the 200 cow budget, a negative total return amounting to $46 per cow

is observed.

Budget 1a - Cow-Calf System Modified, Hay At On Farm Market Price

The question arises as to whether a higher return from hay is obtained by feeding it to the livestock rather than marketing the hay itself. To test this a second cow-calf budget is structured using an on farm market price of $20 per ton for grass-legume hay. All items in this budget remain unchanged except those affected by the change in method of charging hay to the cattle. Taxes and interest on investment for the 62 acres of hay land, as well as approximately one-fourth of the operator's labor, are now included in the hay charge and accordingly reduce these budget items.

Cash expenses become appreciably higher when hay is charged to the cattle at on farm market price. Cash expenses budgeted for this cow-calf model total $21, 440 compared with $18, 868 in Budget 1. Feed expenses amounting to $14, 194 in this model exceed by $2, 863 the corresponding expense for identical kinds and amounts of feed in Budget 1. Cash expenses become $81 greater than cash receipts. Upon comparing budgets for the two models, it is observed that charging hay at an on farm market value of $20 per ton reduced returns above cash costs by $2, 572, other factors held constant.

Discounting non-cash expenses, it appears that greater returns

Budget 1a. Cow-Calf System Modified, Hay at On Farm Market Price

200 Cows	Units	Unit Price	Total	Per Cow
Cash Receipts				
95 steers	435 lbs	$. 2415	$ 9,980	$ 49.90
55 heifers	415	. 2200	5,022	25.11
11 yrlg cull replacement heifers	850	. 1850	1,730	8.65
26 cull cows	1000	. 1491	3,877	19.38
2.6 cull bulls	1500	. 1922	750	3.75
	TOTAL CASH RECEIPTS		$21,359	$106.79
Cash Expenses				
Feed: (Appendix H)				
Hay*	325 T	$ 20.00	$ 6,500	$ 32.50
Cottonseed meal	5.6	80.00	449	2.25
Barley	5	52.00	262	1.31
Salt	3	48.00	144	.72
Mineral	1.1	87.00	96	.48
Pasture*	157 A	42.95	6,743	33.72
		Total feed	$14,194	$ 70.98
Bull replacement	2.6 hd	$425.00	$ 1,105	$ 5.52
Marketing	(3-1/2% of gross cattle sales)		748	3.74
Veterinary-medical supplies			600	3.00
Taxes:				
Land	180 A	5.50	990	4.95
Buildings		(Appendix G)	165	.83
Cattle		(Appendix G)	627	3.14
Insurance		(Appendix F)	69	.34
Transportation	1034 cwt	.27	279	1.40
Repairs on buildings		(Appendix F)	83	.42
Utilities			120	.60
Bedding		(Appendix F)	150	.75
Overhead			200	1.00
Pickup, truck, car expenses*		(Appendix A)	1,540	7.70
Fence maintenance			150	.75
	Total operating capital		$21,020	$105.11
Interest on operating capital (2%)		(Appendix G)	420	2.10
	TOTAL CASH EXPENSES		$21,440	$107.21
CASH RECEIPTS-CASH EXPENSES			$ -81	$ -.41
Non-cash Expenses				
Interest on investment:				
Land	180 A	$ 13.75	$ 2,475	$ 12.38
Cattle housing & hay storage		(Appendix G)	501	2.51
Cattle		(Appendix G)	2,400	12.00
Depreciation		(Appendix G)	668	3.34
Operator's labor*			3,600	18.00
	TOTAL NON-CASH EXPENSES		$ 9,644	$ 48.23
RETURN TO MANAGEMENT			-$ 9,725	-$ 48.62

*Hay labor accounted for 25% of operator labor.

accrue from converting hay into saleable beef than from marketing the hay outright. Based on data used in these two budgets, labor is considered to add $3. 69 per ton while taxes and interest on land amount to $4. 16 per ton of hay produced. Adding these amounts to the $11. 19 per ton production cost (Appendix D), total cost per ton of hay produced amounts to $19. 04. This cost is approximately one dollar below the on farm price charged in the budget and accounts for a corresponding $325 lower return to management. However, returns to management in this budget are $519 lower than in Budget 1. Some small discrepancy, perhaps in allowance for operator's labor, thus becomes apparent. Nevertheless, the return to management difference of $519 appears to be of minor significance in differentiating the feasibility of the two models. Feed accounted for 66 percent of cash costs in this model compared to 60 percent in the previous model.

Budget 2 - Cow-Yearling System, Yearlings Sold Off Grass

A model for the cow-yearling system has been patterned after the cow-calf model. The land and crop complex is held unchanged. The number of cows is reduced to 144 to allow production of feed for the increased number of young animals maintained throughout the year. Six bulls are used in this model where perhaps five would suffice and reduce expenses accordingly. A 76 pound weight differential

is allowed between yearling steers and heifers at marketing.

Returns to management appear more favorable than in the cow-calf model. This result is due in part to the greater feed conversion efficiency of the younger cattle. The 36, 583 more pounds of marketable beef produced from the same acreage of feed more than compensates for the added operating expenses and lower budgeted market price for heavier feeder animals. Large quantities of feed are consumed by mature cows during the wintering period while they are developing a calf that will weigh only 60 to 80 pounds when born in the spring.

Though somewhat improved, returns from this system also are decidedly below the level required to provide for the moderate living needs of an average farm family. Break-even return to management price on long yearling animals is $7. 22 per hundredweight higher than the computed market price used.

For the 239 producing acres of land 421 pounds of yearling beef is considered to be marketed. This amounts to considerably more than the 268 pounds marketed in the cow-calf model. Annual cash expenses per brood cow under this production system amount to $134. Total expenses per cow amount to $215 with receipts per cow totalling $165. Both cash and total expenses per cow exceed those of the cow-calf system. The total receipts per cow from the budgeted cow-yearling operation are $58 per year larger than for the

Budget 2. Cow-Yearling System, Yearlings Sold Off Grass

144 Cows	Units	Unit Price	Total	Per Cow
Cash Receipts				
68 steers	907 lbs	$. 2119	$13,069	$ 90.76
47 heifers	831	.1850	7,226	50.18
19 cull cows	1000	.1491	2,833	19.67
2 cull bulls	1500	.1922	577	4.01
	TOTAL CASH RECEIPTS		$23,705	$164.62
Cash Expenses				
Feed: (Appendix H)				
Hay*	325 T	$ 11.19	$ 3,637	$ 25.26
Cottonseed meal	13	80.00	1,040	7.22
Barley	3.6	52.00	187	1.30
Salt	3	48.00	144	1.00
Mineral	1.1	87.00	96	.67
Pasture*	157 A	42.95	6,743	46.83
		Total feed	$11,847	$ 82.28
Bull replacement	2 hd	425.00	850	5.90
Marketing	(3-1/2% of gross cattle sales)		830	5.76
Veterinary-medical supplies			704	4.89
Taxes:				
Land	242 A	5.50	1,331	9.24
Buildings		(Appendix G)	171	1.19
Cattle		(Appendix G)	575	3.97
Insurance		(Appendix F)	72	.50
Transportation	1227 cwt	.27	331	2.30
Repairs on buildings		(Appendix F)	86	.60
Utilities			120	.83
Bedding		(Appendix F)	154	1.07
Overhead			200	1.39
Pickup, truck, car expenses*		(Appendix A)	1,540	10.69
Fence maintenance			150	1.04
	Total operating capital		$18,961	$131.65
Interest on operating capital (2%)		(Appendix G)	379	2.63
	TOTAL CASH EXPENSES		$19,340	$134.28
CASH RECEIPTS - CASH EXPENSES			$ 4,368	$ 30.33
Non-cash Expenses				
Interest on Investment:				
Land	242 A	$13.75	$ 3,328	$ 23.11
Cattle housing & hay storage		(Appendix G)	532	3.69
Cattle		(Appendix G)	2,489	17.28
Depreciation		(Appendix G)	487	3.38
Operator's labor			4,800	33.33
	TOTAL NON-CASH EXPENSES		$11,636	$ 80.79
RETURN TO MANAGEMENT			-$ 7,268	-$ 50.47

*Includes non-cash expenses on machinery, equipment, and motor vehicles and storage for these items.

cow-calf system. It is further observed that total expenses per cow budgeted for the cow-yearling system exceed those of the cow-calf system by $62. Based on these observations from the budgets, it appears that for 200 cows the cow-yearling system shows negative returns slightly larger than those shown by the 200 cow herd budgeted for the cow-calf system. As budgeted, the cow-yearling system indicates a total negative return of $50 per cow compared to $46 per cow from the cow-calf system.

Budgets 2a and 2b - Cow-Yearling System- Yearlings Short Fed for Slaughter

This model examines the option of finishing to slaughter weight the yearlings produced in Budget 2. Yearling cattle averaging 869 pounds and consisting of approximately 60 percent steers and 40 percent heifers are placed on a finishing ration in a feedlot for a period of 75 days. Using the ration described in Appendix H, an average gross daily gain of 2. 4 pounds is expected. Allowing for one-fourth to one-half percent death loss and three percent market shrink, the market weight is computed from a 2. 32 pound average daily gain during the finishing period.

Steers enter the feedlot averaging 76 pounds heavier than heifers. A 100 pound weight differential between steers and heifers is allowed in the average market weight of 1043 pounds. Cattle gain

an average of 174 pounds of market weight per head during the 75 day finishing period and are expected to grade good and choice when marketed in December or January. Lighter weight cattle of good conformation, but less than the formerly required degree of finish and marbling, have recently been accepted into the good and choice grades.

Budget 2a is a partial transitory budget composed of major items different from, or additional to, those of Budget 2 for the cow-yearling system. Necessary additional grass-legume hay for finishing the cattle is not considered as being available from the supply grown on the farm. The hay required for finishing these animals is therefore treated as being purchased from nearby farms at $20 per ton plus a delivery charge of $3 per ton. Barley for finishing these cattle is not grown on the farm and is therefore also treated as being purchased locally at an on farm price of $44 per ton. An added charge of $2 per ton is budgeted for hauling to the farm and rolling or grinding and mixing on the farm. The operator can save both time and money by owning a power take off or electric motor driven mill of two to four tons per hour capacity with which to prepare his grain. Where custom preparation is available, per ton charges of $6 for grinding plus $5 for mixing are not uncommon. Costs of hauling to and from the custom mill would further add to grain costs.

Budgets 2 and 2a are combined in Budget 2b in order to analyze

Budget 2a. Major Additional or Altered Receipts and Expenses Accruing to Finishing Yearlings (115 Head - 75 Days on Finishing Feed)

144 Cows	Units	Unit Price	Total	Per Cow
Cash Receipts				
68 steers	1093 lbs	$. 2524	$18,759	$130. 27
47 heifers	993	. 2236	10,435	72. 47
	TOTAL CASH RECEIPTS		$29,194	$202. 74
Cash Expenses				
Feed: (Appendix H)				
Purchased hay	41. 2 T	$23. 00	$ 948	$ 6. 58
Cottonseed meal	4. 3	80. 00	344	2. 39
Barley	60. 4	46. 00	2,778	19. 29
Salt	25	48. 00	12	. 08
Mineral	1	87. 00	8	. 06
		Total feed	$ 4,090	$ 28. 40
Veterinary-medical supplies	115 hd	. 50	58	. 40
Taxes on buildings		(Appendix G)	56	. 39
Insurance		(Appendix F)	24	. 17
Repairs on buildings		(Appendix F)	28	. 19
Utilities			10	. 07
Bedding		(Appendix F)	21	. 15
Overhead			50	. 35
Non-cash Expenses				
Interest on investment:				
Cattle housing & hay storage		(Appendix G)	184	1. 28
Cattle		(Appendix G)	111	. 77
Depreciation		(Appendix G)	245	1. 70

the complete cow-yearling system where yearlings are finished for slaughter. Additional housing and feed storage are required. Again the free stall housing arrangement has been used in accordance with university recommendations for least cost suitable housing. Even though this housing is used for only a short period during the year, insurance, repairs, depreciation and interest charges remain essentially unchanged from those involving longer periods of use.

Finishing yearlings under the conditions of the model results in substantially increasing returns over those of Budget 2. These higher returns are attributed primarily to the heavier weights and higher prices received for finished cattle. Additional expenses are less than proportional to the increase in receipts. Feed costs amount to 66 percent of total cash expenses. If additional housing and hay storage could be eliminated by utilizing the original cow-yearling building complex and running some of the other cattle elsewhere during the finishing period, total expenses could be reduced by $500 to $600. As the model is structured, the market price of finished cattle must increase by $3.18 per hundredweight to cover total expenses. An additional fifty cents per hundredweight above the break-even price would provide a reasonable return to management.

Further discussion regarding returns from exercising the finishing option for similar cattle is presented in forthcoming sections.

Budget 2b. Cow-Yearling System, Yearlings Fed for Slaughter (115 Head - 75 Days on Finishing Feed)

144 Cows	Units	Unit Price	Total	Per Cow
Cash Receipts				
68 steers	1093 lbs	$. 2524	$18,759	$130. 29
47 heifers	993	. 2236	10,435	72. 47
19 cull cows	1000	. 1491	2,833	19. 67
2 cull bulls	1500	. 1922	577	4. 01
	TOTAL CASH RECEIPTS		$32,604	$226. 44
Cash Expenses				
Feed: (Appendix H)				
Hay*	325 T	$11. 19		
Purchased hay	41. 2	23. 00	$ 4,585	$ 31. 84
Cottonseed meal	17. 3	80. 00	1,384	9. 61
Barley	64	46. 00	2,944	20. 44
Salt	3. 25	48. 00	156	1. 08
Mineral	1. 2	87. 00	104	. 72
Pasture*	157 A	42. 95	6,743	46. 83
		Total feed	$15,916	$110. 52
Bull replacement	2 hd	425. 00	850	5. 90
Marketing	(3-1/2% of gross cattle sales)		1,141	7. 93
Veterinary-medical supplies			762	5. 29
Taxes:				
Land	242 A	5. 50	1,331	9. 24
Buildings		(Appendix G)	227	1. 58
Cattle		(Appendix G)	572	3. 97
Insurance		(Appendix F)	96	. 67
Transportation	1430 cwt	. 27	386	2. 68
Repairs on buildings		(Appendix F)	114	. 79
Utilities			130	. 90
Bedding		(Appendix F)	175	1. 22
Overhead			250	1. 74
Pickup, truck, car expenses*		(Appendix A)	1,540	10. 69
Fence maintenance			150	1. 04
	Total operating capital		$23,640	$164. 16
Interest on operating capital (2%)		(Appendix G)	473	3. 28
	TOTAL CASH EXPENSES		$24,113	$167. 44
CASH RECEIPTS - CASH EXPENSES			$ 8,491	$ 58. 97
Non-cash Expenses				
Interest on investment:				
Land	242 A	$13. 75	$ 3,328	$ 23. 11
Cattle housing & hay storage		(Appendix G)	716	4. 97
Cattle		(Appendix G)	2,758	19. 15
Depreciation		(Appendix G)	732	5. 08
Operator's labor			4,800	33. 33
	TOTAL NON-CASH EXPENSES		$12,334	$ 85. 64
RETURN TO MANAGEMENT			-$ 3,843	-$ 26. 69

*Includes non-cash expenses on machinery, equipment, and motor vehicles and storage for these items.

Budget 3 - Feeders Purchased in Fall, Wintered, Sold Off Grass

A commonly practiced alternative to the breeding herd systems previously presented is that of buying and selling feeders to utilize the forage produced. Feeder systems eliminate the expenses and feed conversion inefficiencies inherent in systems involving breeding stock. In Budget 3 the hay and pasture acreage remains the same as in previous models. Allowing approximately one ton of hay per head for wintering, a total of 325 head of feeders is necessary to utilize the forage produced. Feeder calves are treated as being purchased in October or November at the same weights and prices as in Budget 1, and in approximately the same steer-heifer ratio as in Budgets 1 and 2. The selling prices are based on 500 to 700 pound feeder prices minus a correction factor of 25 cents per hundredweight for the heavier weights.

Rations and rates of gain used in this model remain the same as in previous models (Appendix H). Cattle are turned on pasture in mid-April at an average weight of 551 pounds and marketed directly off pasture in mid-October after having gained an average of 1.75 pounds per day. As stated under methodology, this rate allows for normal death loss and market shrink.

It is noted from data in this model that selling prices of grass-fed cattle are $3 to $4 per hundreweight below the purchase prices

Budget 3. Feeders Purchased in Fall, Wintered, Sold Off Grass

325 Feeders	Units	Unit Price	Total	Per Feeder
Cash Receipts				
195 steers	907 lbs	$. 2119	$37,477	$115.31
130 heifers	831	.1850	19,986	61.50
	TOTAL CASH RECEIPTS		$57,463	$176.81
Cash Expenses				
195 steers	435 lbs	$. 2415	$20,485	$ 63.03
130 heifers	415	. 2200	11,869	36.52
	Total feeder purchases		$32,354	$ 99.55
Feed: (Appendix H)				
Hay*	325 T	$11.19	$ 3,636	$ 11.19
Cottonseed meal	26.8	80.00	2,145	6.60
Salt	3	48.00	144	.44
Mineral	1.1	87.00	96	.30
Pasture*	157 A	42.95	6,743	20.75
		Total feed	$12,764	$ 39.28
Marketing	(3-1/2% of gross cattle sales)		2,011	6.19
Veterinary-medical supplies			650	2.00
Taxes:				
Land	242 A	5.50	1,331	4.10
Buildings		(Appendix G)	158	.49
Cattle		(Appendix G)	481	1.48
Insurance		(Appendix F)	68	.21
Transportation to and from farm	4237 cwt	.27	1,137	3.50
Repairs on building		(Appendix F)	79	.24
Utilities			120	.37
Bedding		(Appendix F)	140	.43
Overhead			200	.62
Pickup, truck, car expenses*		(Appendix A)	1,540	4.74
Fence maintenance			150	.46
	Total operating capital		$20,829	$ 64.11
Interest on operating capital (2%)		(Appendix G)	417	1.28
	TOTAL CASH EXPENSES		$53,600	$164.94
CASH RECEIPTS - CASH EXPENSES			$ 3,863	$ 11.89
Non-cash Expenses				
Interest on investment:				
Land	242 A	$13.75	$ 3,328	$ 10.24
Cattle housing & hay storage		(Appendix G)	520	1.60
Cattle	(Purchase cost X 1/2% per month owned)		1,941	5.97
Depreciation		(Appendix G)	692	2.13
Operator's labor			4,800	14.77
	TOTAL NON-CASH EXPENSES		$11,281	$ 34.71
RETURN TO MANAGEMENT			-$ 7,418	-$ 22.82

*Includes non-cash expenses on machinery, equipment, and motor vehicles and storage for these items.

paid for calves a year earlier. Such negative margin conditions have generally prevailed for some time in the past marketing history of this kind of buying and selling arrangement. Whenever such a situation exists, if profits are to be realized, the cost per pound of beef produced must be sufficiently below the selling price to compensate for the price differential. An additional $2.60 per hundredweight sold would provide returns necessary for a break-even income to management.

Under this budgeted production system total gain by the 325 steers and heifers amounts to 146,120 pounds. Based on this number of pounds it is observed that an average of 611 pounds of beef per producing acre was turned off. Cost per pound of gain, as budgeted in this production model, is seen to be 22.26 cents--2.10 cents above the selling price and 1.05 cents below the purchase price. As the model is outlined, total cash expenses per feeder amount to $165 including purchase cost of the animal. Total expenses per feeder sum to $200, while receipts per feeder total $177. The minus $7,418 return to management appearing in the budget is thus accounted for by the $23 per head difference in total expenses over total receipts.

It is further noted that in this model 103,350 pounds of gain accrued to the pasture. Based on the pasture cost as budgeted, feed cost per pound of gain attributed to the pasture amounted to 9.76 cents, taxes and interest on land included and man labor not included.

Budgets 3a and 3b - Fall Purchased Feeders Short Fed for Slaughter

Budgets 3a and 3b are patterned after Budgets 2a and 2b in which similar cattle are fed a finishing ration for 75 days. Weights, rations and general management are the same as in the earlier models. Transitory Budget 3a shows altered, or additional, receipts and expenses resulting from finishing the cattle rather than marketing directly off pasture. A second housing and feed storage complex similar to that used for wintering is required for finishing these cattle, inasmuch as fall feeders to go on grass in the spring will be purchased at about the same time these animals are placed in the finishing lot. During this period while 650 head of cattle are to be handled in the two lots, allowance is made to hire additional labor. If the system were layed out properly, using sufficient automation to achieve highly efficient use of labor, or if some family labor were available, it is conceivable that no hired labor would be necessary. If heavier feeders were purchased in January shortly after the finished cattle were marketed, both hired labor and additional housing could be eliminated. Interest on investment in cattle would also be reduced. Furthermore, inasmuch as cattle purchased after January 1 and sold prior to December 31 are not included on the tax assessment rolls, no taxes would be paid on the cattle.

Comparison of the option with marketing feeders directly off

Budget 3a. Major Additional or Altered Receipts and Expenses Accruing to Finishing Fall Purchased Feeders (325 Head - 75 Days on Finishing Feed)

325 Feeders	Units	Unit Price	Total	Per Feeder
Cash Receipts				
195 steers	1093 lbs	$. 2524	$53,795	$165.52
130 heifers	993	. 2236	28,864	88.81
	TOTAL CASH RECEIPTS		$82,659	$254.33
Cash Expenses				
Feed: (Appendix H)				
Purchased hay	116.5 T	$23.00	$ 2,680	$ 8.25
Cottonseed meal	12	80.00	975	3.00
Barley	171	46.00	7,849	24.15
Salt	1	48.00	48	.15
Mineral	.37	87.00	32	.10
		Total feed	$11,584	$ 35.65
Veterinary-medical supplies			162	.50
Taxes:				
Buildings		(Appendix G)	158	.49
Insurance		(Appendix F)	68	.21
Repairs on buildings		(Appendix F)	79	.24
Utilities			25	.08
Bedding		(Appendix F)	58	.18
Overhead			100	.31
Workman's compensation (PD & L)			20	.06
Hired labor	2.5 mo	300.00	750	2.31
	TOTAL CASH EXPENSES		$13,004	$ 40.03
Non-cash Expenses				
Interest on investment:				
Cattle housing & hay storage		(Appendix G)	$ 520	$ 1.60
Cattle (Purchase cost X 1/2% per month owned)			404	1.24
Depreciation		(Appendix G)	696	2.13
	TOTAL NON-CASH EXPENSES		$ 1,620	$ 4.97

Budget 3b. Feeders Purchased in Fall, Wintered, Pastured, Fed for Slaughter (325 Head - 75 Days on Finishing Feed; 14.5 Months Total Feeding)

325 Feeders	Units	Unit Price	Total	Per Feeder
Cash Receipts				
195 steers	1093 lbs	$.2524	$53,795	$165.52
130 heifers	993	.2236	28,864	88.81
	TOTAL CASH RECEIPTS		$82,659	$254.33
Cash Expenses				
195 steers	435 lbs	$.2415	$20,485	$ 63.03
130 heifers	415	.2200	11,869	36.52
	Total feeder purchases		$32,354	$ 99.55
Feed: (Appendix H)				
Hay*	325 T	$11.19		
Purchased hay	116.5	23.00	$ 6,316	$ 19.43
Cottonseed meal	38.8	80.00	3,120	9.60
Barley	171.0	46.00	7,849	24.15
Salt	4	48.00	192	.59
Mineral	1.5	7.00	130	.40
Pasture*	157 A	42.95	6,743	20.75
		Total feed	$24,350	$ 74.92
Marketing	(3-1/2% of gross cattle sales)		2,893	8.90
Veterinary - medical supplies			812	2.50
Taxes:				
Land	242 A	5.50	1,331	4.10
Buildings		(Appendix G)	316	.97
Cattle		(Appendix G)	481	1.48
Insurance		(Appendix F)	136	.42
Transportation	4810 cwt	.27	1,285	3.95
Repairs on buildings		(Appendix F)	158	.49
Utilities			145	.45
Bedding		(Appendix F)	198	.61
Overhead			300	.92
Pickup, truck and car expenses*		(Appendix A)	1,540	4.74
Fence maintenance			150	.46
Workman's compensation (PD & L)			20	.06
Hired labor	2.5 mo	300	750	2.31
	Total operating capital		$34,865	$107.28
Interest on operating capital (2%)		(Appendix G)	697	2.14
	TOTAL CASH EXPENSES		$67,916	$208.97
CASH RECEIPTS - CASH EXPENSES			$14,743	$ 45.36
Non-cash Expenses				
Interest on investment:				
Land	242 A	$13.75	$ 3,328	$ 10.24
Cattle housing and hay storage		(Appendix G)	1,040	3.20
Cattle (Purchase cost 1/2% per month owned)			2,346	7.22
Depreciation		(Appendix G)	1,384	4.26
Operator's labor			4,800	14.77
	TOTAL NON-CASH EXPENSES		$12,898	$ 39.69
RETURN TO MANAGEMENT			$ 1,845	$ 5.68

*Includes non-cash expenses on machinery, equipment, and motor vehicles and storage for these items.

grass shows cash receipts to be approximately $25,000 higher than when the grass-fed cattle were marketed. This is attributed to a selling price more than $4 per hundredweight higher for the heavier weight finished cattle. Grass fed cattle do not typically bring comparatively high prices because these animals will not grade as high as finished cattle if slaughtered, and do not gain as efficiently as lighter cattle if fed out. Even though additional housing and labor expenses are required, this system shows a positive return to management of $1845 compared to a minus $7,418 when cattle were marketed off grass. This implies reasonably good returns from the finishing phase of the system.

From this model in which feeders are fed for 75 days in a feedlot, receipts per feeder have increased to $254. Cash expenses per head have moved to $209, while total expenses now amount to $249 per head. The input-output relationships incorporated into this model parallel those found in Budget 2b, in which comparable yearlings were fed for slaughter after 75 days in a feedlot. However, inasmuch as this budgeted system for finishing grass fed feeder cattle for slaughter does not involve the expense of maintaining a breeding herd, $5 to $6 per feeder is returned above all costs. This computed profit accrues primarily to the favorable shift in the cost-price ratio considered to exist when the cattle were fed to slaughter weight and grade. Total cost per pound of gain amounted to 23.82

cents, somewhat higher than for the feeders sold directly off grass. However, the budgeted selling price of 24.15 cents per pound is slightly above the cost per pound of gain. It is noted that a fraction of a cent per pound can effect sizeable gains or losses when the total poundage marketed approaches the magnitude involved in this model.

Budget 3c - Late Fall Purchased Feeders Fed 120 Days for Slaughter

Taking count of the results of Budgets 3, 3a, and 3b, a model has been structured in which feeders are purchased in December at an average weight of 463 pounds, wintered until grazing commences in April, and fed 120 days in the feedlot beginning August 1. Management is otherwise essentially identical to previously mentioned practices. Expenses for hired labor and the extra housing complex of Budget 3b have been eliminated, thus reducing total costs substantially. The problem cited in the literature review whereby cattle fail to make satisfactory gains after early August is overcome in this model.

Calves purchased in December are programmed to gain 90 pounds during four months of wintering before going on pasture averaging 553 pounds in mid-April. According to data compiled from beef producers interviewed, an average of 654 pounds of beef per acre can normally be expected with feeder cattle. Approximately

two-thirds of feeder gain can be expected by August 1. By then 65 to 70 percent of the pasture production will have taken place, according to farm crops specialist William S. McGuire (9). During the shorter wintering period of only four months, about three-fourths of a ton of hay per head will be consumed. This reduction in hay requirements allows the pasture acreage to be increased thus increasing total annual carrying capacity to 348 head. Heavier stocking rate per acre for this shorter pasture season is thereby facilitated. Inasmuch as cattle are to be grazed during the period of highest pasture growth, net average daily gain is increased to two pounds per head for this model. Assuming one-third of pasture production will occur after August 1, the 168 acres used for pasture will yield 1,388 tons of hay per acre after cattle are removed (233 tons total).

Cattle are scheduled to go into the feedlot for 120 days averaging 763 pounds and must net two and one-third pounds of gain per head per day to attain an average of 1043 pounds market weight after shrink and death loss. Being of lighter average feedlot weight these cattle are assumed to gain slightly more rapidly than the heavier cattle discussed in the previous model. The longer finishing period of 120 days allowed in this model is dictated by the need to have these cattle reach market weight prior to the time that it becomes necessary to purchase new feeders for the following year's operation. Overlapping of the two groups of incoming and outgoing cattle

Budget 3c. Late Fall Purchased Feeders, Wintered, Pastured, Fed 120 Days for Slaughter (348 Head - 1 Year Total Feeding)

348 Feeders	Units	Unit Price	Total	Per Feeder
Cash Receipts				
209 steers	1093 lbs	$. 2500	$57,109	$164.11
139 heifers	993	. 2208	30,476	87.57
	TOTAL CASH RECEIPTS		$87,585	$251.68
Cash Expenses				
209 steers	475 lbs	$. 2454	$24,361	$ 70.00
139 heifers	445	. 2184	13,509	38.82
	Total feeder purchases		$37,870	$108.82
Feed: (Appendix H)				
Hay*	450 T	$11.19	$ 5,036	$ 14.47
Cottonseed meal	41.8	80.00	3,552	10.21
Barley	292	46.00	13,432	38.60
Salt	4	48.00	192	.55
Mineral	1.5	87.00	130	.37
Pasture*	168 A	42.95	7,216	20.74
		Total feed	$29,558	$ 84.94
Marketing	(3-1/2% of gross cattle sales)		3,065	8.81
Veterinary-medical supplies			696	2.00
Taxes:				
Land	242 A	5.50	1,331	3.82
Buildings		(Appendix G)	170	.49
Cattle		(Appendix G)	515	1.48
Insurance		(Appendix F)	73	.21
Transportation	5276 cwt	.27	1,415	4.07
Repairs on buildings		(Appendix F)	85	.24
Utilities			120	.34
Bedding		(Appendix F)	198	.57
Overhead			300	.86
Pickup, truck, car expenses*		(Appendix A)	1,540	4.43
Fence maintenance			150	.43
	Total operating capital		$39,216	$112.69
Interest on operating capital (2%)		(Appendix G)	810	2.33
	TOTAL CASH EXPENSES		$77,896	$223.84
CASH RECEIPTS - CASH EXPENSES			$ 9,689	$ 27.84
Non-cash Expenses				
Interest on investment:				
Land	242 A	$13.75	$ 3,328	$ 9.56
Cattle housing & hay storage		(Appendix G)	557	1.60
Cattle (Purchase cost X 1/2% per month owned)			2,272	6.53
Depreciation		(Appendix G)	741	2.13
Operator's labor			4,800	13.79
	TOTAL NON-CASH EXPENSES		$11,698	$ 33.61
RETURN TO MANAGEMENT			-$ 2,009	-$ 5.77

*Includes non-cash expenses on machinery, equipment, and motor vehicles and storage for these items.

must be avoided in order to escape the duplicate housing requirement and hired labor cost items found in Budget 3b.

Prior to structuring a budget for this modified system, it was hypothesized that a higher return to management would result, having eliminated hired labor and nearly half of the housing related expenses. However, it is seen that a negative return again occurs. Careful analysis of this model reveals a very enlightening lesson regarding the importance of prices and marketing. Feed costs are higher than in Budget 3b by the amount attributed to feeding 23 additional animals and shortening the wintering period. Some adjustment of the quantities of items used was necessitated due to modifying the management. Cattle prices, however, while varying only slightly from those of the previous model, account for a significant difference in costs and returns per head. Feeders average 36 pounds per head more when purchased than in the previous model. The cost of the heavier steers is $11.52 per head higher at only 39 cents more per hundredweight. Heifer price is taken to be 16 cents per hundredweight lower but is offset by the heavier purchase weight resulting in an increased cost of $5.89 per head. Based on the model, the selling price of steers, while only 24 cents lower per hundredweight than in Budget 3b, reduces receipts per head by $2.62. Selling price of heifers, while eight cents per hundreweight higher than in Budget 3b, increases receipts per head by only 79 cents. To this seemingly inconsequential

price fluctuation found to exist in the 1958-64 Portland market report, can be attributed a loss of more than $3800.

Based on this budget, receipts per head total $252 and total expenses sum to $257 per head. It thereby becomes apparent that a small shift in the cost-price ratio has brought about a loss of about $5 per head, an amount nearly equal to the profit which obtains in Budget 3b. Break-even income to management could be attained with a price increase of 55 cents per hundredweight. Each pound of gain cost an average of 25.19 cents, whereas selling price in this model is 23.90 cents per pound.

Budget 4 - Feeders Purchased in Spring, Sold Off Grass

A system whereby feeder cattle are purchased in the spring and marketed at the end of the grazing season appeals to many producers. This system utilizes minimum amounts of labor in that almost all forage produced on the farm can be harvested by the cattle through grazing. Only the excess forage produced and harvested for hay or silage involves appreciable amounts of labor. A single operator can manage relatively large pasture acreages and numbers of feeder cattle when this system is followed. Budget 4 is designed to examine the feasibility of this operating system.

For this operating system 464 head of feeder cattle are assumed to be purchased in mid-April when pasture growth is sufficient

to sustain heavy grazing. Following previous models, an average purchase weight of 551 pounds is used. Management is essentially identical to that of fall purchased feeders after wintering. The entire farm acreage is programmed to be used for pasture production.

Again allowing 1.75 pounds average daily gain, a total of 151,248 pounds of marketable beef is produced. Dividing this number of pounds by the 239 acres used for pasture production shows that an average of 633 pounds per acre were turned off. Thirty acres of new seeding not being grazed is considered to have produced the 60 tons of hay listed under feed in the budget.

In analyzing the model it is again noted that a wide negative margin exists between spring pruchase and fall market prices. With cost per pound of gain (18.93 cents) being lower than selling price (20.16 cents), the negative return to management (-$6,953) must be attributed to the buying (23.48 cents) versus selling price differential. Selling price must be $1.62 per hundredweight higher to erase the negative net return. This negative return also could be erased by reducing purchase price by $2.58 per hundredweight.

Summarizing the model on a per head basis, the following receipts-expenses relationships prevail: total receipts, $177; cash expenses, $170; total expenses, $191; and total net loss, $14.

Budget 4. Feeders Purchased in Spring, Sold Off Grass (464 Head - 182 Days)

464 Feeders	Units	Unit Price	Total	Per Feeder
Cash Receipts				
278 steers	907 lbs	$. 2119	$53,429	$115.15
186 heifers	831	.1850	28,596	61.63
	TOTAL CASH RECEIPTS		$82,025	$176.78
Cash Expenses				
278 steers	565 lbs	$. 2452	$38,514	$ 83.00
186 heifers	529	.2182	21,470	46.27
	Total feeder purchases		$59,984	$129.27
Feed: (Appendix H)				
Hay*	60 T	$11.19	$ 671	$ 1.45
Salt	2.8	48.00	134	.29
Mineral	1	87.00	87	.19
Pasture*	209 A	42.95	8,977	19.35
		Total feed	$ 9,869	$ 21.28
Marketing	(3-1/2% of gross cattle sales)		2,871	6.19
Veterinary-medical supplies			464	1.00
Taxes:				
Land	242 A	5.50	1,331	2.87
Transportation to and from farm	6622 cwt	.27	1,788	3.85
Utilities			120	.26
Overhead			200	.43
Pickup, truck, car expense*		(Appendix A)	1,540	3.32
Fence maintenance			150	.32
	Total operating capital		$18,333	$ 39.52
Interest on operating capital (2%)		(Appendix G)	367	.79
	TOTAL CASH EXPENSES		$78,684	$169.58
CASH RECEIPTS - CASH EXPENSES			$ 3,341	$ 7.20
Non-cash Expenses				
Interest on investment:				
Land	242 A	$13.75	$ 3,328	$ 7.17
Cattle (Purchase cost X 1/2% per month owned)			1,800	3.88
Operator's labor			4,800	10.34
	TOTAL NON-CASH EXPENSES		$ 9,928	$ 21.39
RETURN TO MANAGEMENT			-$ 6,593	-$ 14.21

*Includes non-cash expenses on machinery, equipment, and motor vehicles and storage for these items.

Budget 4a. Major Additional or Altered Receipts and Expenses Accruing to Finishing Spring Purchased Feeders (464 Head - 75 Days on Finishing Feed)

464 Feeders	Units	Unit Price	Total	Per Feeder
Cash Receipts				
278 steers	1093 lbs	$. 2524	$76,692	$165. 28
186 heifers	993	. 2236	41,298	89. 00
	TOTAL CASH RECEIPTS		$117,990	$254. 28
Cash Expenses				
Feed: (Appendix H)				
Purchased hay	166. 3 T	$23. 00	$ 3,825	$ 8. 24
Cottonseed meal	17. 4	80. 00	1,392	3. 00
Barley	244. 0	46. 00	11,224	24. 19
Salt	1. 1	48. 00	55	. 12
Mineral	0. 5	87. 00	37	. 08
		Total feed	$16,533	$ 35. 63
Veterinary-medical supplies			232	. 50
Taxes		(Appendix G)	226	. 49
Insurance		(Appendix F)	97	. 21
Repairs on buildings		(Appendix F)	113	. 24
Utilities			35	. 08
Bedding		(Appendix F)	84	. 18
Overhead			100	. 22
Non-cash Expenses				
Interest on investment:				
Cattle housing & hay storage		(Appendix G)	742	1. 60
Cattle (Purchase cost X 1/2% per month owned)			750	1. 62
Depreciation		(Appendix G)	988	2. 13

Budget 4b. Feeders Purchased in Spring, Pastured, Fed for Slaughter (464 Head - 75 Days on Finishing Feed)

464 Feeders	Units	Unit Price	Total	Per Feeder
Cash Receipts				
278 steers	1093 lbs	$. 2524	$76,692	$165. 28
186 heifers	993	. 2236	41,298	89. 00
	TOTAL CASH RECEIPTS		$117,990	$254. 29
Cash Expenses				
278 steers	565 lbs	$. 2452	$38,514	$ 83. 00
186 heifers	529	. 2182	21,470	46. 27
	Total feeder purchase		$59,984	$129. 27
Feed: (Appendix H)				
Hay*	60 T	$11. 19		
Purchased hay	166. 3	23. 00	$ 4,496	$ 9. 69
Cottonseed meal	17. 4	80. 00	1,392	3. 00
Barley	244. 8	46. 00	11,224	24. 19
Salt	3. 9	48. 00	189	. 41
Mineral	1. 5	87. 00	130	. 28
Pasture*	209 A	42. 95	8,977	19. 35
		Total feed	$26,408	$ 56. 92
Marketing	(3-1/2% of gross cattle sales)		4,130	8. 90
Veterinary-medical supplies			696	1. 50
Taxes:				
Land		(Appendix G)	1,331	2. 87
Buildings		(Appendix G)	226	. 49
Insurance		(Appendix F)	97	. 21
Transportation to and from farm	7440 cwt	. 27	2,009	4. 33
Repairs on buildings		(Appendix F)	113	. 24
Utilities			155	. 33
Bedding		(Appendix A)	84	. 18
Overhead			300	. 65
Pickup, truck, car expense*		(Appendix A)	1,540	3. 32
Fence maintenance			150	. 32
	Total operating capital		$37,239	$ 80. 26
Interest on operating capital (2%)		(Appendix G)	745	1. 61
	TOTAL CASH EXPENSES		$97,968	$211. 14
CASH RECEIPTS - CASH EXPENSES			$20,022	$ 43. 15
Non-cash Expenses				
Interest on investment:				
Land	242 A	$13. 75	$ 3,323	$ 7. 17
Cattle housing and hay storage		(Appendix G)	742	1. 60
Cattle (Purchase cost X 1/2% per month owned)			2,549	5. 49
Depreciation		(Appendix G)	988	2. 13
Operator's labor			4,800	10. 34
	TOTAL NON-CASH EXPENSES		$12,407	$ 26. 73
RETURN TO MANAGEMENT			$ 7,615	$ 16. 41

*Includes non-cash expenses on machinery, equipment, and motor vehicles and storage for these items.

Budgets 4a and 4b - Feeders Purchased in Spring, Pastured, Fed for Slaughter

A transitory budget (4a) is again used to show modifications involved in exercising the finishing option summarized in Budget 4b. It is noted that previously unneeded housing and feed storage now become added expense items. This program provides for better distribution of operator labor throughout the year without necessitating the hiring of additional labor.

As in Budget 3b, the selling price of finished cattle is substantially higher than that of cattle marketed directly off grass. Total costs per pound of gain, additional housing expense included, are decidedly below the selling price per pound. Total receipts in this model are of sufficient magnitude to provide a favorable return to management that is comparable to that of other kinds of businesses. A reduction in selling price of $1.56 per hundredweight would erase returns to management back to zero. Prices can fluctuate by this amount within a one or two week interval. In this model total cost per pound of gain is 21.62 cents; receipts per pound total 24.15 cents; and purchase cost equals 23.48 cents per pound. Based on the cost-price ratios and input-output relationships exhibited in the model, the following per head observations accrue: total receipts, $254; total expenses, $238; cash expenses, $211; and net income to management, $16.

Budget 5 - Feeders Purchased in Fall, Full Fed on Roughage

The following model is designed to test what might result if feeders were confined to a lot and fed all the roughage they would eat. The entire farm is programmed to be used to produce forage crops to be harvested and fed to the cattle confined to a lot. For this model, cattle are not turned on the land to graze at any time. The ration (Appendix H) fed is composed of grass-legume hay, corn silage, and cottonseed meal. Full fed on this ration, cattle are expected to gain a net average of 1. 4 pounds per head per day, after death loss and market shrink allowances.

Purchasing calves similar to those considered to be sold in the cow-calf system, cattle averaging 427 pounds are assumed to be purchased in the fall. They are full fed on a roughage ration for a period of eight months. They can then be sold as heavy feeders averaging 763 pounds or allowed to remain in the feedlot on a finishing ration for 120 days. The latter option is detailed in Budget 5a. The number of feeders (700 head) used in structuring this model is based on the productive capacity of the farm assuming yields of 5 and 18 tons per acre for hay and corn silage, respectively. The number of cattle corresponds to the option of marketing as heavy spring feeders. The farm is divided into 109 acres for hay and 130 acres for silage production.

Several factors should be taken into account when silage feeding is considered. Total digestible nutrient content varies markedly in corn silage, depending on the number and size of ears, maturity when harvested, and storage conditions. It is well to have a feed analysis run on silage if any appreciable amount is to be fed. Care must also be taken when feeding silage to lighter animals. The lighter animals may lack sufficient digestive capacity to consume and utilize the large amounts of silage necessary to produce desired gains.

One full-time man is assumed to be hired for this model. Feed storage differs from that of previous models by virtue of the silage feeding not previously programmed. Costs attributed to the given combination of silage and hay storage facilities are considered as being equivalent to those of previous models on a per head basis.

Total pounds of beef produced in this model is 239, 400 pounds. An average of 1002 pounds per acre for the 239 producing acres in the farm is thus derived. This is a substantial increase in pounds of beef produced per acre compared to previous models. However, even with this tremendous beef yield, cost per pound of gain is 23.11 cents. Average selling price is 23. 24 cents per pound and average purchase price is 23. 30 cents per pound. Practically no margin is found to exist between these three price-cost figures. It is therefore to be expected that no appreciable return to management, positive or

Budget 5. Feeders Purchased in Fall, Full Fed on Roughage (700 Head - 240 Days)

700 Feeders	Units	Unit Price	Total	Per Feeder
Cash Receipts				
420 steers	793 lbs	$. 2427	$80,833	$115.48
280 heifers	733	. 2157	44,271	63.24
	TOTAL CASH RECEIPTS		$125,104	$178.72
Cash Expenses				
420 steers	435 lbs	$. 2415	$44,121	$ 63.03
280 heifers	415	. 2200	25,564	36.52
	Total feeder purchases		$69,685	$ 99.55
Feed: (Appendix H)				
Hay*	504 T	$11.19	$ 5,640	$ 8.06
Cottonseed meal	84	80.00	6,720	9.60
Salt	5.6	48.00	269	.38
Mineral	2	87.00	174	.25
Corn silage*	2352	4.90	11,525	16.46
		Total feed	$24,328	$ 34.75
Marketing	(3-1/2% of gross cattle sales)		4,379	6.26
Veterinary-medical supplies			931	1.33
Taxes:				
Land	242 A	5.50	1,391	1.90
Buildings		(Appendix G)	341	.49
Cattle		(Appendix G)	1,036	1.48
Insurance		(Appendix F)	147	.21
Transportation to and from farm	8372 cwt	.27	2,260	3.23
Repair on buildings		(Appendix F)	171	.24
Utilities		20.00	160	.23
Bedding		(Appendix F)	399	.57
Overhead			300	.43
Pickup, truck, car expenses*		(Appendix A)	1,540	2.20
Workman compensation (PD & L)			55	.08
Hired labor	12 mo	300.00	3,600	5.14
	Total operating capital		$40,978	$ 58.54
Interest on operating capital (2%)		(Appendix G)	820	1.17
	TOTAL CASH EXPENSES		$111,483	$159.26
CASH RECEIPTS - CASH EXPENSES			$13,621	$ 19.46
Non-cash Expenses				
Interest on investment:				
Land	242 A	$13.75	$ 3,328	$ 4.75
Cattle housing and hay storage		(Appendix G)	1,120	1.60
Cattle (Purchase cost X 1/2% per month owned)			2,787	3.98
Depreciation		(Apprendix G)	1,491	2.13
Operator's labor			4,800	6.86
	TOTAL NON-CASH EXPENSES		$13,526	$ 19.32
RETURN TO MANAGEMENT			$ -95	$ -.14

*Includes non-cash expenses on machinery, equipment, and motor vehicles and storage for these items.

negative, would prevail. This is evidenced by the $95 total net return computed in the budget. On this large number of pounds of beef only a few cents difference in any one of the three price-cost figures would completely change the profit-loss picture. As budgeted, total expenses and total receipts per head each approximate $179.

Budgets 5a and 5b - Feeders Purchased in Fall, Full-Fed on Roughage, Fed 120 Days for Slaughter

As in previous models where the finishing of cattle was practiced, Budget 5a illustrates additional or altered receipts and major expenses. It is combined with Budget 5 in setting up Budget 5b, which examines the 120 day finishing option.

Budget 5b is structured to analyze the option of finishing cattle after full feeding on roughage, as in Budget 5. Market price is again found to be sufficiently increased by finishing the cattle to provide a favorable profit return margin. As budgeted, cost per pound of gain (22.80 cents) is lower than selling price per pound (24.30 cents). Purchase price (23.31 cents) per pound is observed to fall between cost per pound of gain and selling price. Selling price is $1.29 per hundredweight above the level necessary to break-even on return to management. Average receipts per feeder amount to $256 while total expenses sum to $242, thus allowing $14 per head net return to management.

Budget 5a. Major Additional or Altered Receipts and Expenses Accruing to Finishing Cattle Full Fed on Roughage (700 Head - 120 Days on Finishing Feed)

700 Feeders	Units	Unit Price	Total	Per Feeder
Cash Receipts				
420 steers	1093 lbs	$. 2527	$116,004	$165.72
280 heifers	993	. 2269	63,087	90.12
	TOTAL CASH RECEIPTS		$179,091	$255.84
Cash Expenses				
Feed: (Appendix H)				
Purchased hay	379.3 T	$23.00	$ 8,724	$ 12.46
Cottonseed meal	42	80.00	3,360	4.80
Barley	588	46.00	27,048	38.64
Salt	2.8	48.00	134	.19
Mineral	1	87.00	87	.12
		Total feed	$39,353	$ 56.21
Veterinary-medical supplies			469	.67
Utilities			80	.11
Bedding		(Appendix F)	56	.08
Overhead			100	.14
Operator's labor			4,800	6.86
Non-cash Expenses				
Interest on investment:				
Cattle (Purchase cost X 1/2% per month owned)			$ 1,394	$ 1.99

Budget 5b. Feeders Purchased in Fall, Full Fed on Roughage, Fed 120 Days for Slaughter (700 Head - 360 Days Total)

700 Feeders	Units	Unit Price	Total	Per Feeder
Cash Receipts				
420 steers	1093 lbs	$. 2527	$116,004	$165.72
280 heifers	993	.2269	63,087	90.12
	TOTAL CASH RECEIPTS		$179,091	$255.84
Cash Expenses				
420 steers	435	.2415	$44,121	$ 63.03
280 heifers	415	.2200	25,564	36.52
	Total feeder purchase		$69,685	$ 99.55
Feed: (Appendix H)				
Hay*	504 T	$11.19		
Purchased hay	379.3	23.00	$14,363	$ 20.52
Cottonseed meal	126	80.00	10,080	14.40
Barley	588	46.00	27,048	38.64
Salt	8.4	48.00	403	.58
Mineral	3	87.00	261	.37
Corn silage*	2352	4.90	11,525	16.46
		Total feed	$63,681	$ 90.97
Marketing	(3-1/2% of gross cattle sales)		6,108	8.73
Veterinary-medical supplies			1,400	2.00
Taxes:				
Land	242 A	5.50	1,331	1.90
Buildings		(Appendix G)	341	.49
Cattle		(Appendix G)	1,036	1.48
Insurance		(Appendix F)	147	.21
Transportation to and from farm	10360 cwt	.27	2,797	4.00
Repairs on buildings		(Appendix F)	171	.24
Utilities			240	.34
Bedding		(Appendix F)	455	.65
Overhead			400	.57
Pickup, truck, car expenses*		(Appendix A)	1,540	2.20
Workman's compensation (PD & L)			55	.08
Hired labor	12 mo	300.00	3,600	5.14
	Total operating capital		$83,302	$119.00
Interest on operating capital (2%)		(Appendix G)	1,666	2.38
	TOTAL CASH EXPENSES		$154,653	$220.93
CASH RECEIPTS - CASH EXPENSES			$24,438	$ 34.91
Non-cash Expenses				
Interest on investment:				
Land	242 A	$13.73	$ 3,328	$ 4.75
Cattle housing & hay		(Appendix G)	1,120	1.60
Cattle		(Appendix G)	4,181	5.97
Depreciation		(Appendix G)	1,491	2.13
Operator's labor			4,800	6.86
	TOTAL NON-CASH EXPENSES		$14,920	$ 21.31
RETURN TO MANAGEMENT			$ 9,518	$ 13.60

*Includes non-cash expenses on machinery, equipment, and motor vehicles and storage for these items.

Alternative Land Uses

To provide a comparison of the selected beef production enterprises with possible alternative uses of the less well drained valley floor soils, estimated costs and returns from field corn and bush bean enterprises are briefly discussed.

According to a 1965 study by Miller (10), field corn produced under sprinkler irrigation on the less well drained soils of the Willamette Valley appears to be a marginal crop. Receipts and expenses resulted in what essentially amounts to an exchange of dollars. Residual returns to fixed costs, management, entrepreneurship, and summer labor amounted to approximately $45 to $50 per acre. Allowing for these items it is apparent that net returns can be expected to be quite small, or even negative. Added together, taxes and interest on land and equipment, depreciation on equipment, and summer labor amount to a sizeable expense.

In the same study, however, bush beans were found to provide reasonably good net returns. With yields averaging around three and one-half tons per acre, residual returns to the factors listed above amounted to $120 to $130 per acre. The summer labor expense for this enterprise is higher than for field corn. After allowing for fixed cash and non-cash costs as well as the higher summer labor expense, bush beans appear to be a more profitable enterprise

than either field corn or most of the livestock production systems analyzed. However, it is highly doubtful that a 242 acre farm would be planted to bush beans.

Based on the expected net returns from field corn and bush beans found in Miller's study, it appears that those beef production systems showing the highest returns are competitive with the bush bean enterprise. The systems of beef production showing small positive or negative net returns are comparable to the field corn enterprise. Both field corn and bush beans can be expected to provide higher net returns per acre than the breeding beef systems and the system in which feeders are purchased in the spring and marketed directly off pasture.

SUMMARY AND CONCLUSIONS

This study was designed to test the economic feasibility of selected systems of beef production on less well drained Willamette Valley floor soils under irrigation. Though generally applicable to the entire valley, the counties selected for the survey to obtain production and other data are: Benton, Polk, and Linn. The potential development of water resources in the study area for irrigation purposes is causing pronounced concern regarding readjustments in the utilization of valley floor land. The production and utilization of pasture and forage crops through beef cattle is receiving increased emphasis in the study area. Farmers who are considering utilizing the Woodburn, Amity, and Dayton soils for beef production are in need of guideline beef production data to compare with alternative land uses.

Basic input-output relationships, cost-price ratios, and related data were obtained from a survey of beef producers in the survey area. Names of producers used in the survey were obtained from county agents in the survey area counties. Eight basic alternative beef production systems are analyzed. They are: (1) cow-calf system, (2) cow-yearling system, (3) cow-yearling system, yearlings finished for slaughter, (4) feeders purchased in the fall, wintered, and pastured, (5) same as (4) except feeders finished for slaughter,

(6) feeders purchased in the spring and pastured, (7) same as (6) except feeders finished for slaughter, and (8) feeders purchased in the fall, wintered on a full feed roughage ration, marketed as heavy spring feeders, or finished for slaughter.

Budgeted models were constructed for the purpose of analyzing and comparing the economic feasibility of the enumerated systems. Two identical cow-calf systems were budgeted to test whether returns to management are higher when hay is marketed through livestock rather than marketing the hay outright. The difference in returns did not appear highly significant. The budgets involving a finishing period have been separated into three parts: (1) basic forage utilizing operation, (2) transitory budget leading to finishing, and (3) combined budget itemizing total receipts and expenses.

Two basic methods of producing beef are studied. One method requires a breeding herd. The other is concerned with stocker and feeder cattle. Using yield data that are considered to be typical for the study area, it is estimated that 242 acres of land are needed for a 200 cow cow-calf operation. The number of cattle budgeted for all selected systems is based on the carrying capacity of a 242 acre farm.

Based on the budgets as they have been structured, Table 2 shows the costs and returns per cow, per feeder, and per pound for the selected beef production systems. The four systems in which a

Table 2. Estimated Cost Per Pound and Returns Per Head for Beef Produced Under 11 Budgeted Alternative Systems, Willamette Valley, Oregon, 1965.

System	Unit	Returns above		Costs per pound marketed		Selling Price	Change to break-even
		Cash Costs	Total Costs	Cash Costs	Total Costs		
		Dollars		Cents per pound			
Cow-calf	Per cow	12.46	-46.03	29.41	37.74	23.38	+14.36
Cow-calf*	Per cow	- .41	-48.62	33.42	38.54	23.38	+15.16
Cow-yearling	Per cow	30.33	-50.47	19.20	30.79	20.14	+10.65
Cow-yearling, yearlings finished	Per cow	58.97	-26.69	19.93	29.73	24.12	+ 5.61
Fall purchased feeders, pastured	Per feeder	11.89	-22.82	18.81	22.77	20.16	+ 2.61
Fall purchased feeders, pastured, finished	Per feeder	45.36	5.68	19.85	23.61	24.15	- .54
Late fall purchased feeders, pastured, finished	Per feeder	27.84	- 5.77	21.26	24.45	23.90	+ .55
Spring purchased feeders, pastured	Per feeder	7.20	-14.21	19.35	21.79	20.16	+ 1.63
Spring purchased feeders, pastured, finished	Per feeder	43.15	16.41	20.05	22.59	24.15	- 1.56
Fall purchased feeders, full fed on roughage	Per feeder	19.46	.14	20.71	23.22	23.24	- .02
Fall purchased feeders, full fed on roughage, finished	Per feeder	34.91	13.60	20.98	23.01	24.30	- 1.29

*Hay budgeted at on farm market price rather than at production cost excluding labor.

breeding herd is maintained show negative returns to management. The two systems in which feeders are marketed off grass also show negative returns. Fall purchased feeders full fed on roughage show total receipts approximately equal to total expenses. The late fall purchased feeder system in which the cattle are finished for slaughter also show negative returns to management. Positive returns are indicated from the systems in which feeders are purchased early in the fall or in the spring and finished for slaughter after having been pastured or fed on roughage.

When performance levels, prices, and other conditions are comparable to those typified in this study, it is concluded that beef production systems designed to use only the forages produced on less well drained Willamette Vally floor soils are not economically feasible. Systems requiring a breeding herd will not provide positive returns to management regardless of whether calves are marketed as weaners, as long yearlings off grass, or retained and finished for slaughter. As budgeted, the cow-calf and cow-yearling systems would turn off 268 and 421 pounds of marketed weanling and yearling beef per acre, respectively. The negative net returns are attributed primarily to the low number of pounds of beef turned off per acre and its value relative to the large amounts of feed and other input costs required to maintain the breeding herd. Based on the budgets as structured, the selling prices of weanling cattle would have to

increase by 14 to 16 cents per pound above the reported 1958-64 average Portland market prices to allow break-even or positive returns to management. The probability of experiencing a price increase of this magnitude is considered to be zero. For the budgeted cow-yearling system, the price increase necessary to obtain break-even or positive net returns is 10 to 12 cents per pound. This much increase is also highly improbable. The additional five to six cents per pound needed to eliminate negative returns from the cow-yearling system in which yearlings are finished for slaughter might be obtained occasionally. It is highly unlikely that any producer would consistently be able to market his finished yearling cattle at prices five to six cents above the average market price without incurring additional production costs.

All budgeted systems in which forage and/or pasture supply the primary feeds are also characterized by negative returns. Amounts of beef turned off per acre range from 611 to 1002 pounds for the systems in which stocker cattle are purchased and fed on roughages and/or pasture. While the levels of output are reasonably good, the typical negative differential between purchase prices and selling prices prohibit these systems from showing positive net returns above all costs. Based on the 1958-64 Portland market reports, purchase prices of stocker and feeder cattle average about 24 cents per pound compared to selling prices of about 20 cents per

pound for heavy grass fed cattle. Budgeted total costs per pound of beef marketed average 22 to 23 cents. It is concluded from these purchasing versus selling price relationships that average marketing prices two to three cents per pound higher than those budgeted would provide positive net returns from these systems. Price fluctuations of this magnitude can occur within a short period of time. Some producers might make up for this negative margin by skillful management and marketing techniques.

Positive net returns are indicated for systems in which feeder cattle are purchased and finished for slaughter after feeding them on roughages and/or pasture. Average prices for finished cattle are approximately equal to purchase prices, thus eliminating the negative margin between purchasing and selling prices. As budgeted, the more profitable systems in which purchased feeders were finished after roughage feeding indicate returns to management comparable to those of other businesses. Normal price fluctuations could conceivably erase these returns.

Under conditions similar to those represented in the framework of this study, it is again evident that favorable returns must be normally achieved by making substantial reductions in total expenses. Prices cannot normally be expected to reach and be sustained at the necessary levels for reasonable returns without costs also being affected; nor can they be appreciably influenced by the individual

producer. The most profitable beef production system for a given farm would depend upon the resources available on that particular farm. Returns above cash costs appear sufficient to merit consideration of some of the systems as supplemental farm enterprises to utilize resources which cannot otherwise be profitably utilized. Individual producers may be able to reduce some production costs below the levels budgeted for this study. By careful planning, a sprinkler system may be installed for a capital outlay of less than $120 per acre. Annual mileage may be somewhat reduced. By purchasing cheaper materials and utilizing operator and family labor, comparable cattle housing and hay storage may be constructed at lower costs. More efficient feed conversion ratios may be obtained. Marketing expenses, shrink, and transportation charges might be reduced by selling cattle at the farm rather than in Portland. A more favorable local market may be available to some producers. It should be recognized, however, that the budgets structured for this study represent typical performance in the area. If practices, performance rates, prices, and other conditions obtained by any individual producer are more favorable than the averages in this study, or if resource requirements are reduced, the beef enterprise can become more competetive with other crop and livestock enterprises in the area.

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APPENDICES

APPENDIX A

Machinery and Equipment Needs

Machine Item	New Price	Own*	Rent*
Tractor	$5000	22	-
Plow (16 in 2 bottom)	335	12	10
Disc (10 ft)	800	12	10
Spike harrow	125	12	10
Grain drill		-	22
Mower (7 ft)	492	21	-
Rake (side delivery)	475	12	8
Pick-up baler	2000	8	12
Wagon	450	21	-
Hay loader (field type)	475	17	1
Truck ($1\frac{1}{2}$ T) (14-16 ft. bed)	3000	22	2
Auto (farm share $\frac{1}{2}$)	1500	22	-
Pickup ($\frac{1}{2}$ T 6 cyl.)	2300	22	-
Manure spreader	800	18	4
Fertilizer spreader (10-12 ft.)	425	22	could hire commercially
Hay elevator (w. o. motor)	135	16	-
Spray equipment (cattle)	105	8	8
Shop equipment	1000	22	-
Scraper and scoop	775	16	2
Cattle squeeze	325	22	-

*Numbers under own and rent refer to the numbers of operators interviewed who indicated whether they would own or rent the corresponding item.

Optional Equipment

Machine Item	Price
Field chopper	$2200
Blower	750
Feeder box wagon	1300
Swather	4000
Platform scales	1400
Single unit scales	200

Pickup, Truck, and Car Expenses*

	Price
Pickup 6, 000 mi. @ 11¢/mi	$660
$1\frac{1}{2}$ ton truck 4, 000 mi. @ 18¢/mi	720
Family car 2, 000 mi. @ 8¢/mi	160
	$1540

*Based on rates taken from California Farm Management Handbook (14).

Machinery Performance Rates*

Operation	Acres/hr.
Mowing hay (7 ft bar)	2.50
Swathing hay	4.25
Raking	2.75
Baling	4.80 T/hr.
Field chopping (corn silage)	9.00 T/hr.
Plowing (2-16 in bottoms)	1.00
Discing (10 ft)	4.00
Seeding with drill (10 ft)	4.00
Fertilizing (flow spreader)	5.00
Harrowing	5.00
Cultivating corn	4.00
Clipping pastures	3.00

NOTE: A rate of $2.00/hr. is used in this study as average for the tractor and implement complement. This rate includes all operating, depreciation, taxes, insurance, repairs and housing costs developed from costs of operating various sizes and types of tractors in Marion County, Oregon (2).

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*Rates are median rates computed from data obtained from the beef producers interviewed for this study.

APPENDIX B

Annual Cost Per Acre-Sprinkler Irrigation System
(Based on capital outlay of $120 per acre)

Interest ($120 ÷ 2 X 6%)	$ 3.60
Depreciation (15 years straight line)	8.00
Power*	6.60
Taxes and insurance (2%)	2.40
Maintenance and repairs	.50
Water cost	?
	$21.10
Man labor (2.22 A/hr. = 3.6 hr/A for 8 irrigations @ $1.50/hr.)	5.40
Total Cost	$26.50

*Varies with number of irrigations, efficiency of system and water source.

APPENDIX C

Labor Requirements Per Acre for Establishing Hay or Pasture
(Based on data obtained from beef producers interviewed for this study)

Operation	No. Times	Man hrs. /A	Machine hrs. /A
Plow	1	1.0	1.0
Disc	2	0.5	0.5
Harrow & roll	1	0.2	0.2
Drill	1	0.5	0.5
Fertilize	2	0.4	0.4
Irrigate	8	3.6	0.23
Clip	1	0.3	0.3
Mow	1	0.4	0.4
Rake	1	0.3	0.3
Bale	1	0.4	0.4
Haul	1	2.0	2.0
		9.6	6.23

Pasture Establishment Costs Per Acre

Machinery	$12.50
Irrigation	21.10
Clover seed (2 lb @ $1.00/lb)	2.00
Grass seed (15 lbs @ $0.50/lb)	7.50
Fertilizer (300 lbs @ $81/T)	12.15
	$55.25
Hay credit (2 T @ $11.19/T production cost)	22.38
	$32.87
Annual cost per productive acre (based on 7 yrs production)	$ 4.70

Labor Requirements Per Acre for Producing Pasture

Operation	No. Times	Man hrs. /A	Machine hrs. /A
Irrigate	8	3.6	.23
Fertilize	2	0.4	0.4
Clip	2	.67	.67
Harrow	1	.2	.2
		4.87	1.50

Annual Pasture Costs Per Acre

Establishment (stand depreciation)	$ 4.70
Machinery[1] 1.5 hr @ 2.00/hr.	3.00
Irrigation	21.10
Fertilizer	12.15
Harvesting excess spring growth[2]	2.00
	$42.95[3]

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[1] Fertilize 2 times @ 5 A/hr = .40 hr.
Clip 2 times @ 3 A/hr = .67 hr.
Harrow 2 times @ 5 A/hr = .20 hr.
Irrigate (moving pipe) = .23 hr.

[2] Based on 1/3 of pasture acreage being harvested for hay early in spring (May 1-15) with a yield of 1.75 T/A.

Mowing	0.40 hr.
Raking	.50 hr.*
Baling	.35 hr.
Hauling	1.75 hr.
	3.00 hrs/A @ $2.00/hr

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*Allows for turning some hay that becomes rained on.

[3] Add $2.00 for each ton of lime applied to new seeding. Man labor excluded.

APPENDIX D

Annual Labor Requirements Per Acre for Producing Hay
(Based on 3 cuttings and 5 ton yield)

Operation	Man hrs/A	Machine hrs/A
Irrigating (8 times)	3.6	.23
Fertilizing (2 times)	0.4	0.4
Mowing	1.2	1.2
Raking	1.1	1.1
Baling (5.0 T/hr)	1.0	1.0
Hauling (1 T/man/hr)	5.0	5.0
	12.3	8.93

Cost of Producing Hay Per Ton

Machinery (54 A X 8.93 hrs/A X $2.00/hr)	$ 964
Fertilizer (54 A X 300 lb/A X $81/T)	656
Irrigation (54 A X $21.10/A[1])	1139
Establishment (8 A X $55.25/A[2])(excludes hay credit)	442
62 A Total	$3201

$3201 ÷ 286 = $11.19 cost per ton excluding man labor

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[1] Appendix B

[2] Appendix C

APPENDIX E

Cost[1] of Producing Corn Silage Per Ton
(Based on 18 T per acre yield-irrigated)

Operation	No. Times	Performance Rate	Cost/A[2]	Cost/T
Plowing	1	1 hr/A	$2.00	$0.111
Discing	2	1 hr/A	2.00	0.111
Harrow & roll	2			
Planting	1	0.5 hr/A	1.00	0.056
Cultivating	2	0.5 hr/A	1.00	0.056
Spraying	1	0.25 hr/A	0.50	0.028
Fertilizing	2	0.4 hr/A	0.80	0.044
Irrigating	$2\frac{1}{2}$	$16.70/A	16.70	0.928
Field Chopping	1	$10/18 T[3]	7.00	0.388
Hauling	1		33.00	1.833
Seed	(18 lb @ $.12/lb)		2.16	0.120
Fertilizer	450 lb @ $80/T		18.00	1.000
Spray Material	4 lb/A @ $1.00/lb		4.00	0.222
		Total		$4.90/T

[1] Calculated from "break-even" operation rates obtained from Clayton Johnson (6) and machinery performance rates from Appendix A. Man labor excluded.

[2] Basic machinery charge of $2.00/hr for operations requiring tractor power includes fixed costs and storage of machinery item.

[3] Man labor included.

APPENDIX F

Annual Building Costs Per Animal
(Based on building recommendations of the Oregon State University Extension Agricultural Engineers)

Mature animal:

Stall (32 sq ft @ $1.25/sq ft)	$40
Hay storage with feed bunk (24 sq ft @ $1.25/sq ft)	30
Total building cost	$70
Concrete lot (60 sq ft @ 23¢/sq ft)	14*
Total cost	$80

Young animal (425-1000 pounds):

Stall (75% of cost for mature animal)	$30
Hay storage with feed bunk (17.5 sq ft @ $1.25/sq ft)	22*
Total building cost	$52
Concrete lot (52.5 sq ft @ 23¢/sq ft)	12
Total cost	$64

A. Building taxes are computed as 2% of half life building value. Tax on the concrete lot has been omitted to compensate for assessed value (true cash value) of building complex being lower than actual construction cost (labor included).

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*Actual costs of $13.80 and $21.56 are rounded upward since no separate charge is made for fencing the ends of the lot between stalls and hay storage.

Mature animals (56 sq ft @ $0.0125/sq ft)	$0.70
Young animals (39 sq ft @ $0.0125/sq ft)	0.4875

B. Building repairs are computed as 1/2 % of new value as adopted from rates used by Suter (18).

Mature animals (56 sq ft @ $0.00625/sq ft)	$0.35
Young animals (39 sq ft @ $0.00625/sq ft)	0.2438

C. Building insurance is computed as 1.02% of 80% of half-life value. This rate is in accordance with current rates obtained from Harold Nelson's insurance agency of Corvallis, Oregon. Rates per head are rounded to the nearest cent.

Mature animals ($70 ÷ 2 X 80% X 1.02%)	$0.29
Young animals ($52 ÷ 2 X 80% X 1.02%)	0.21

D. Interest on investment in buildings and surfaced lot is computed as being 5% of half-life value.

Mature animals ($84 ÷ 2 X 5%)	$2.10
Young animals ($64 ÷ 2 X 5%)	1.60

E. Depreciation on buildings and lot is computed on the straight line method with 30 years life expectancy.

Mature animals ($84 ÷ 30)	$2.80
Young animals ($64 ÷ 30)	2.13

Bedding Costs Per Animal

(Based on recommendations of Oregon State University Extension Agricultural Engineers and data obtained from beef producers interviewed for this study.)

Add 2 inches of shavings or sawdust per stall per month of use.

Value of bedding is computed as being $4 per unit (200 cu ft) or 2 cents per sq ft.

Mature animals (2 in/mo X 6 mo)	$0.64
Young animals (2 in/mo X 6 mo)	0.43

APPENDIX G

Basis of Computing Taxes Per Unit

Land ($275/A @ 5%) $5.50 per acre

Machinery and equipment (taxes included in rate/hr)

Cattle per head				
Calves (6 mo-1 yr)	Steers (1-2 yrs)	Heifers (1-2 yrs)	Cows (2 yrs)*	Bulls (1 yr)*
$1.48	$2.38	$1.98	$2.56	$4.56

A. Taxes on land are based on 25% of true cash value (market value) times the millage rate (average rate of 80 mills used in this study is equivalent to a rate of 2% of true cash value).

B. Cattle values are based on a 1958-64 average of true cash values set for tax purposes by Western Oregon assessors. Taxes on cattle are based on 25% of true cash value times 80 mills.

C. Taxes on buildings are based on 25% of half-life true cash value times 80 mills or 2%.

Depreciation and Interest Rates Charged

Interest

Fixed capital (land and buildings)	5%
Working capital (sprinkler system, cattle*)	6%
Operating capital (1/3 of cash operating expenses @ 6%)	2%

Depreciation

Buildings (no salvage)	30 yrs
Sprinkler system	15 yrs
Machinery and equipment (included in rate/hr)	

*Interest on cattle is computed on the following cattle values: cows $160; bulls $425; yearling replacements $115; feeder cattle (purchase cost X 1/2% per month owned).

APPENDIX H

Total Digestible Nutrient Requirements*

(Numbers indicate pounds)

Animal Weight	Expected Average Daily Gain 1	1.5	2.0	2.5	3.0
400	5.4	6.1	7.9	9.1	10.3
500	6.3	7.7	9.1	10.5	11.9
600	7.1	8.7	10.3	11.9	13.5
700	7.9	9.6	11.4	13.2	14.9
800	8.6	10.5	12.5	14.4	16.3
900	9.3	11.4	13.5	15.6	17.6
1000	10.0	12.2	14.4	16.7	18.9

*Assuming there is no other restriction.

Average Composition of Feeds

(Expressed as percent dry weight)

	Dry Matter	Dig. Prot.	TDN
Alf. hay 1/10 bloom	90.6	11.0	50.1
Barley	90.0	6.9	79
Corn (well mature, fair ears)	26.7	1.1	17.4
Cotton seed meal	91.0	34.5	66

NOTE: The above tables are taken from data compiled by Ralston (15).

Daily Rations* Per Head for Selected Classes of Cattle
(Based on TDN table and suggestions from Oregon State University Animal Scientists)

Wintering rations (165 days)	Pounds
Mature beef cow	
10 lbs grass-legume hay (45 days in fall) 18-20 lbs grass-legume hay (120 days)	2750
Beef bull (120% of cow requirement)	3300
Pregnant beef heifer	
15 lbs grass-legume hay	2475
1 lb cottonseed meal	165
3 lb rolled barley (120 days)	360
Feeder calves 427 lbs average beginning weight. (0. 75 lb gain per day)	
12 lbs grass-legume hay	1980
1 lb cottonseed meal	165

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600 pound feeder calves (full fed on roughage for 1. 4 lbs gain per day)

6 lbs hay (1 lb grass-legume hay per 100 lbs body weight)

1 lb cottonseed meal

28 lbs corn silage (well matured, fair in ears, 17. 4% TDN)

Finishing 900-950 pound cattle (2.4 lbs daily gain)

1 lb grass-legume hay per 100 lbs body weight

1 lb cottonseed meal

14 lb rolled barley

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*All cattle to receive approximately two pounds salt and three-fourths pound mineral supplement per head per month.

APPENDIX I

Average 1958-64 Mid-month Portland Market Prices of Selected Classes of Cattle

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Slaughter Steer 900 lbs-1100 lbs (good & choice)	25.55	24.89	25.54	25.76	25.51	25.81	25.92	25.75	25.47 (25.27)	25.07	25.07 (25.00)	24.93
Slaughter Heifer 600 lbs-800 lbs (good)	22.82	22.50	23.25	23.67	23.56	23.45	23.27	22.99	22.86 (22.69)	22.52	22.25 (22.08	21.90
Feeder Steer Calf 300 lbs-500 lbs (good & choice)	25.60	26.11	27.38	28.59	25.74	27.42	26.89	24.78	24.21	24.25 (24.15)	24.08	24.54
Feeder Steer 500 lbs-700 lbs (good)	22.69	23.11	23.86	24.52	23.52 (24.27)	25.02	24.00	21.78	21.69	21.44	21.08	21.28
Slaughter Cows (utility grade	15.86	15.80	16.53	16.59	16.54	15.79	15.25	15.30	14.91	14.99 (14.70)	14.40	14.64
Beef Bulls (commercial grade)	20.08	20.27	20.52	20.68	20.85	20.35	20.12 (19.75)	19.22	20.02	19.44	19.69	18.95