

# Production/Marketing Alternatives for Northern Minnesota Cow-Calf Producers

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## TABLE OF CONTENTS

CHAPTER I: INTRODUCTION	3
CHAPTER II: THE SIMPLE MODEL--PROCEDURES AND ASSUMPTIONS	4
Sources Of Data	4
Cow-Calf Budgets	5
Wintering Budgets	7
Summering Budgets	10
CHAPTER III: THE SIMPLE MODEL--RESULTS AND DISCUSSION	13
Returns To The Cow-Calf Enterprise	13
Returns To Wintering	15
Returns To Summering	15
Conclusions	20
CHAPTER IV: THE LINEAR PROGRAMMING MODEL--PROCEDURES AND ASSUMPTIONS	22
Linear Programming Matrix	22
Objective Function	25
CHAPTER V: THE LINEAR PROGRAMMING MODEL--RESULTS AND DISCUSSION	28
REFERENCES	34
APPENDIX A: SOURCES OF DATA	35
APPENDIX B: COW-CALF BUDGETS	43
APPENDIX C: STEERS-WINTERING BUDGETS	50
APPENDIX D: HEIFERS-WINTERING BUDGETS	53
APPENDIX E: STEERS-SUMMERING BUDGETS	56
APPENDIX F: DETAILED LINEAR PROGRAM BUDGETS	60

## LIST OF TABLES

Table 1. Assumed Nutritional Analyses Of Corn And Hay	4
Table 2. Cow-Calf Annual Feed Requirements	6
Table 3. Cow-Calf Unit--Other Cash And Non-Cash Costs (1978 Dollars)	7
Table 4. Winter Feed Requirements	8
Table 5. Wintering--Other Cash And Non-Cash Costs (1978 Dollars)	9
Table 6. Summary Of Rates Of Gain And Weights Used For The Summering Budgets	10
Table 7. Summering--Other Cash And Non-Cash Costs (1978 Dollars)	12
Table 8. Returns Over Feed And Cash Costs For The Cow-Calf Unit (1978 Dollars)	14
Table 9. Returns Over Feed And Cash Costs For Wintering Steers (1978 Dollars)	16
Table 10. Returns Over Feed And Cash Costs For Wintering Heifers (1978 Dollars)	17
Table 11. Summering And Combination Wintering And Summering Returns Over Cash Costs--Steers - July 15 Sale (1978 Dollars)	18
Table 12. Summering And Combination Wintering And Summering Returns Over Cash Costs--Steers - October 15 Sale (1978 Dollars)	19
Table 13. Linear Programming Matrix	23
Table 14. Animal Flow Calendar	24
Table 15. Other Cash Costs For A Replacement Heifer (1978 Dollars)	26
Table 16. Linear Programming Budgets (1978 Dollars)	26
Table 17. Linear Programming Budgets (1978 Dollars)	27
Table 18. Alternatives Selected In The Final Solution	29
Table 19. The Marginal Cost Of Forcing One Unit Of A Slack Alternative (1978 Dollars)	30

PRODUCTION/MARKETING ALTERNATIVES FOR NORTHERN MINNESOTA COW-CALF PRODUCERS

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CHAPTER I

INTRODUCTION

Cow-calf producers in northern Minnesota typically market their feeder cattle as calves in the fall of the year (20). This study compares returns from that enterprise with returns from a program that carries the animals through the winter and markets them in the spring, and with one that continues to carry the short yearling steers through the summer on pasture. The intent of the study is to determine the most profitable production/marketing strategy during each stage of the cattle production/price cycle.

The cyclical nature of cattle prices is a key element in returns to the cattle industry. A complete cattle cycle with increases and reductions in cattle numbers lasts approximately 10 years. No two cycles are identical. Past cycles can, however, be divided into three phases: expansion, liquidation and transition (9). Each phase has its own distinguishing characteristics.

The expansion phase is marked by rapidly increasing cattle numbers, low slaughter relative to inventory, and high cattle prices. Returns to beef producers during this phase are usually above average. Producers retain a higher-than-average proportion of heifers as replacement stock and cull fewer cows, resulting in high prices and expanding cattle inventories. After cattle numbers have expanded for a few years, prices decline, first for slaughter and then for feeder animals. The decrease in prices is typically quite significant and large losses occur. Cow-calf producers, faced with lower prices, begin reducing the number of cows retained. This signals the end of the expansion phase and the beginning of the liquidation phase of the cattle cycle.

The liquidation phase is marked by low cattle prices, a sharp decline in the growth rate of cattle numbers followed by decreasing numbers, and increased slaughter relative to cattle inventories. Cow-calf operators reduce herd sizes by increasing culling rates and decreasing the number of heifers retained as replacements. With increased beef supplies, prices decrease or remain low and continued culling occurs. After a few years beef supplies decrease and prices recover. The cycle then moves into the transition phase.

The transition phase is characterized by a stabilization in cattle numbers followed by a normal increase in numbers, normal slaughter relative to inventories, and average cattle prices and returns. During the transition phase, cow numbers are maintained. As population and real income increases, demand for beef increases. The demand for beef eventually outpaces the relatively low rate of increase in supply and prices begin to increase. With increased prices, cattle producers begin increasing herd sizes, moving back into the expansion phase, thus completing the cycle (9).

In this study, costs and returns were developed for several alternative production/marketing strategies for 31 years from 1948-49 through 1978-79. This period spans three full cattle cycles. For the purpose of this study, technology was assumed to be constant in the development of the budgets. After developing the budgets, a linear programming model was developed to aid in determining the most profitable production/marketing strategy for the 31-year period. From this, some recommendations are made for a general marketing strategy that can best cope with the cyclical price swings inherent in the beef cycle.

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## CHAPTER II

### THE SIMPLE MODEL--PROCEDURES AND ASSUMPTIONS

A fundamental assumption, that past prices and returns provide insight into the future, is necessary for justification of the study of past costs and returns. Given that the cattle cycle has been a regularly occurring phenomenon throughout this century, it seems prudent to expect that cycles will continue in the future. Therefore, yearly budgets for the past 31 years were developed for three production alternatives: the cow-calf unit with the calf sold in the fall, the calf carried through the winter and sold in the spring (hereafter referred to as wintering), and the short yearling steer carried through the summer on pasture (hereafter referred to as summering).

A complete budgeting technique was used for the cow-calf unit. The budget included the costs and returns associated with maintaining the cow (including culling and replacement considerations) and producing a calf to be marketed in the fall. Since all production/marketing alternatives considered are part of a continuum, budgets for carrying the calf through the winter and the short yearling steer through the summer were developed as partial budgets. These budgets show the returns to wintering and summering separate from and as an addition to the returns from the cow-calf enterprise.

The budgets were computed using nominal (unadjusted for inflation) price and cost data for the year in question. Cattle prices, interest rates, and feed prices were used in their nominal form to compute receipts and expenses, which were then converted into 1978 dollars. Cash costs for which accurate nominal figures were not available were classified as "other cash costs". These costs, along with non-cash costs, were figured in 1978 dollars and were deducted after the other costs and receipts had been converted to 1978 dollars. This method assumes that there were no significant cost-saving technological advances during the past three decades in feeder cattle production--an assumption that is quite close to reality.

#### Sources Of Data

Historical data used to compute the budgets were collected from several sources. Cattle prices were obtained solely from the U.S. Department of Agriculture's Detailed Livestock Quotations, yearly and monthly summaries for the South St. Paul cattle market (5). The "Prices Paid By Farmers Index (commodities, interest, taxes and wage rates)" was used to adjust receipts from nominal dollars into 1978 dollars (1,2). The Production Credit Association's (PCA) annual average cost of loans was used to compute interest costs (2,22).

Feed expenses were based on the prices received by farmers for all hay (seasonal average, baled, per ton) and corn (seasonal average, per bushel) found in Minnesota Agricultural Statistics (17). Even though corn is not competitively obtainable in some areas of northern Minnesota, given the substitutability of most high energy grains and their high cross price elasticity, corn was selected as the proxy for the various energy feedstuffs fed in northern Minnesota.

To reflect hay quality and price in northern Minnesota the "all hay" category was used and the average Minnesota price was multiplied by a factor of .85. Prices in northern Minnesota are typically lower than in the rest of the state because of the normal high supply of hay relative to the demand in that area. The hay was assumed to be an alfalfa-bromegrass mixture. The rations formulated all contained a 20% wastage factor for hay consumption and a 10% wastage factor for corn consumption. The assumed nutrient contents, on a dry matter basis, for corn and hay can be found in Table 1.

Table 1. Assumed Nutritional Analyses Of Corn And Hay

<u>Dry Matter Basis</u>	<u>Crude Protein</u>	<u>Net Energy For Maintenance</u>	<u>Net Energy For Gain</u>
	(%)	(Mcal/lb.)	(Mcal/lb.)
Corn	10.0	1.03	0.67
Alfalfa-bromegrass hay	14.4	0.52	0.20

The Beef Cow Herd Planning Guide (8) was used as a reference for determining the other cash and non-cash costs. Some additions and modifications were made based on detailed cost records of keeping beef cows and overwintering and pasturing feeders obtained by one of the authors from beef producers cooperating in the Upper Great Lakes Beef Demonstration Project, 1976-79. A summary of the data used to compute the budgets can be found in Appendix A.

### Cow-Calf Budgets

Yearly cow-calf budgets were developed for 1948 through 1978. Because of the ongoing nature of the cow-calf operation, culling and raising replacements were incorporated into each budget. The budgets were developed for a single cow plus that fraction of a calf, replacement heifer, and cull cow that is implied by the normal proportions of these animals found in a beef herd. The returns over cash costs and all costs were computed using the following equations:

$$(1) \quad ROC_n = CI_n + CC_n - FE_n - IC_n - OC$$

$$(2) \quad ROA_n = ROC_n - NC$$

where

n = year	IC = interest costs
ROC = returns over cash costs in 1978 dollars	OC = other cash costs
CI = calf sales income	ROA = returns over all costs in 1978 dollars
CC = cull cow sales income	NC = non-cash costs
FE = feed expenses	

Receipts were generated from calf and cull cow sales. For each year, 75%, 85% and 95% calf crops (live calves in the fall as a percent of cows overwintered) were simulated. Using average October choice calf prices, calf sales income was computed with the following equation:

$$(3) \quad CI_n = [((PCT/2) \times SCP_n \times 4.25) + (((PCT/2) - 16.5) \times HCP_n \times 4.00)] \times 219/PPI_n$$

where

n = year	SCP = steer calf price (\$/cwt.)
CI = calf sales income in 1978 dollars	HCP = heifer calf price (\$/cwt.)
PCT = percent calf crop expressed in decimal	PPI = price paid by farmers index number

The October 15 assumed sale weights were 425 lb. for steers and 400 lb. for heifers. The 16.5 in equation 3 reflects a 15% replacement rate with a 1.5% death loss before the heifers enter the herd. The 219 is the index number for 1978 prices paid by farmers, and was used to convert the income to 1978 dollars.

Cull cow income was derived from the average October utility cow price using equation 4. With a 2% assumed death loss for cows, 13% of the herd was sold as 1000 lb. cull cows.

$$(4) \quad CC_n = 10.0 \times 0.13 \times CCP_n \times 219/PPI_n$$

where

n = year	CCP = cull cow price (\$/cwt.)
CC = cull cow sales income in 1978 dollars	PPI = prices paid by farmers index number

Feed expenses were based on corn and alfalfa-bromegrass hay rations (19). The total amount of feed necessary was determined by the cow requirements and the replacement stock requirements adjusted to reflect the 15% replacement rate. The rations for the cows were balanced given the following assumptions: 1) calving March 1, 2) second trimester from August 24 to November 26, 3) third

trimester from November 27 to February 28, 4) pastured from May 16 to October 15, and 5) a 1000 lb. cow of average milking ability. The replacements were wintered at a 1.5 lb./day rate of gain and weighed 718 lb. May 15. They were summered on pasture and were assumed to weigh 871 lb. October 15-- a gain of 1.0 lb./day. The total amount of feed required for the replacement included the wintering feed plus the additional feed requirements above those of the cow beginning when the heifer enters the herd through calving. The replacement heifer is assumed to enter the herd October 15 and additional feed is required to support continued growth. The feed requirements are shown in Table 2.

Table 2. Cow-Calf Annual Feed Requirements

	<u>Corn</u> (bu.)	<u>Alfalfa-Bromegrass Hay</u> (T.)
Cow requirement	0.00	2.57
15% of the replacement requirement	<u>3.32</u>	<u>0.22</u>
Annual requirement	3.32	2.79

To arrive at the annual feed expenses the following equation was used:

$$(5) \quad FE_n = [(2.79 \times PH_n) + (3.32 \times PC_n)] \times 219/PPI_n$$

where

n = year	PC = price of corn (\$/bu.)
FE = annual feed expense in 1978 dollars	PPI = price paid by farmers index number
PH = price of hay (\$/T)	

Interest costs were computed using the average annual interest rate charged by PCA and the following equations:

$$(6) \quad RP_n = [((P2_n - P1_n)/(W2_n - W1_n)) \times (871 - W1_n)] + P1_n$$

$$(7) \quad IC_n = [(10.0 \times ACCP_n \times IR_n) + ((RP_n \times 871) + (HCP_{n-1} \times 4.0))/2 \times IR_n \times 0.15] \times 219/PPI_n$$

where

n = year	IC = interest costs in 1978 dollars
RP = average October choice heifer price for an animal weighing 871 lb. (\$/cwt.)	ACCP = average annual utility cow price (\$/cwt.)
P1,P2 = the average October choice heifer prices for weights W1 and W2, respectively (\$/cwt.)	IR = interest rate expressed in decimal
W1,W2 = the average weights for the two weight categories nearest 871 lb. (lb.)	HCP = heifer calf price (n-1 = the year before, \$/cwt.)
	PPI = prices paid by farmers index number.

Equation 6 simply determines the average October price for an 871 lb. heifer by interpolating the price from those of the two nearest weight categories. The first part of equation 7 determines the interest on a 1000 lb. cow valued using the annual average utility cow price. The second part of equation 7 determines the interest on the replacement using the average October choice heifer calf price from the year before.

Table 3 shows the other cash and non-cash costs for the cow-calf unit in 1978 dollars. The replacement and cull cow shares are included in the budget for the cow-calf unit.

Cow-calf receipts, expenses and feed requirements are summarized in Appendix B.

Table 3. Cow-Calf Unit--Other Cash And Non-Cash Costs (1978 Dollars)

	<u>Cow-Calf Unit</u>	<u>Replacement Share</u>	<u>Cull Cow Share</u>
<u>Other Cash Costs</u>			
1. Mineral and salt	\$ 4.00	\$ .60	
2. Breeding fees or bull	7.00	1.00	
3. Veterinary and medicine	5.00	.60	
4. Repair and maintenance	6.00		
5. Utilities, power and fuel	4.00	.65	
6. Miscellaneous	3.00	.15	
7. Marketing costs	<u>6.00</u>		<u>\$1.50</u>
Total other cash costs	\$35.00	\$3.20	\$1.50
<u>Non-cash costs</u>			
1. Building and fence \$50 @ 10%	\$ 5.00		
2. Livestock equipment \$50 @ 15%	7.50		
3. Power and machinery \$70 @ 15%	10.50		
4. Pasture 5 months @ \$5/month	25.00		
5. Labor 10 hr./yr. @ \$4/hr.	<u>40.00</u>		
Total non-cash costs	\$88.00		
TOTAL OTHER CASH AND NON-CASH COSTS	\$123.00		

Wintering Budgets

Yearly wintering budgets for steers and heifers were developed for 1949 through 1979. The partial budgets assumed carrying the calf from October 15 until May 15. Rates of gain of 0.5, 1.0 and 1.5 lb./day were simulated for both steers and heifers. Steer and heifer calves were assumed to weigh 425 and 400 lb. respectively on October 15. The feeding period was 212 days. The May 15 weights for the respective rates of gain were 506, 612 and 718 lb. for the heifers and 531, 637 and 743 lb. for the steers. The returns over cash costs and all costs were computed using the following equations:

$$(8) \quad \text{ROCW}_n = \text{GMW}_n - \text{FEW}_n - \text{ICW}_n - \text{DLW}_n - \text{OCW}$$

$$(9) \quad \text{ROAW}_n = \text{ROCW}_n - \text{NCW}$$

where

n = year	DLW = death loss costs
ROCW = wintering return over cash costs in 1978 dollars	OCW = other cash costs
GMW = gross margin	ROAW = wintering return over all costs in 1978 dollars
FEW = feed expenses	NCW = non-cash costs
ICW = interest costs	

The gross margin was determined from the average October choice steer and heifer calf prices and the average May choice feeder steer and heifer prices using the following equations:

$$(10) \quad \text{MP}_n = [((\text{P2}_n - \text{P1}_n)/(\text{W2}_n - \text{W1}_n)) \times (\text{W} - \text{W1}_n)] + \text{P1}_n$$

(11) If  $\text{MP}_n$  (0.5 lb./day gain) is less than  $\text{MP}_n$  (1.0 lb./day gain) then

$$\text{MP}_n \text{ (0.5 lb./day gain)} = \text{MP}_n \times 1.02$$

(12) IF  $\text{MP}_n$  (1.5 lb./day gain) is greater than  $\text{MP}_n$  (1.0 lb./day gain) then

$$\text{MP}_n \text{ (1.5 lb./day gain)} = \text{MP}_n \times 0.98$$

$$(13) \quad GMW_n = [(MP_n \times W) \times 219/PPI_n] - [(CFP_{n-1} \times CW) \times 219/PPI_{n-1}]$$

where

n	= year	GMW	= gross margin for wintering in 1978 dollars
MP	= average May feeder price for an animal weighing W (\$/cwt.)	PPI	= prices paid by farmers index number
P1,P2	= the average May feeder price for weights W1 and W2, respectively (\$/cwt.)	CFP	= average October choice calf price (n-1 = year before, \$/cwt.)
W	= weight of the animal on May 15 (lb.)	CW	= weight of calf October 15 (cwt.)
W1,W2	= the average weights for the two weight categories nearest weight W (lb.)		

Equation 10 arrives at the May sale price for an animal of a specific weight by interpolating from the prices for the average weights of the two nearest weight categories. Equations 11 and 12 were designed to adjust prices for the condition and finish. The animals wintered at 1.5 lb./day gain will have more condition than those wintered at 0.5 lb./day, although they are the same age. Research suggests an inverse relationship between prices and the amount of condition on feeder cattle of the same age (18). Therefore, prices were adjusted upward 2% for the low rate of gain and downward 2% for the high rate of gain. The gross margin is computed in equation 13. It is the value in 1978 dollars of the short yearling in May minus the value in 1978 dollars of the calf in October. The prices in the fall and spring were adjusted by different index numbers. The difference between the index numbers reflects a change in the value of the dollar during this period because, during an inflationary time period, the purchasing power of the dollar decreases. This method of computation understates the nominal dollar returns to wintering in most years but is more realistic in terms of real (constant) dollar returns. The constant (219) used in the equation was the "Prices Paid By Farmers Index" number for 1978 (2).

Feed expenses were computed using the prices for corn and alfalfa-bromegrass hay. The following equation was used to arrive at the feed expenses:

$$(14) \quad FEW_n = [(QH \times PH_n) + (QC \times PC_n)] \times 219/PPI_n$$

where

n	= year	QC	= quantity of corn (bu.)
FEW	= wintering feed expenses in 1978 dollars	PC	= price of corn (\$/bu.)
QH	= quantity of hay (T)	PPI	= prices paid by farmers index number
PH	= price of hay (\$/T)		

Table 4 shows the corn and hay requirements during the wintering period for steers and heifers at the various rates of gain. They were formulated using the net energy system and requirements from the Nutrient Requirements of Beef Cattle (19), along with the feed wastage assumptions stated earlier.

Table 4. Winter Feed Requirements

	Rate of Gain (lb./day)	Corn (bu.)	Alfalfa-bromegrass Hay (T)
Steer	0.5	1.32	1.60
Steer	1.0	8.05	1.57
Steer	1.5	17.03	1.48
Heifer	0.5	1.53	1.51
Heifer	1.0	9.63	1.44
Heifer	1.5	20.21	1.30



Interest costs were computed on the average value of the animal using PCA's average cost of loans. The following equations were used to arrive at the interest costs:

$$(15) \quad AV_n = [(MP_n \times W \times 219/PPI_n) + (CFP_{n-1} \times CW \times 219/PPI_{n-1})]/2$$

$$(16) \quad ICW_n = (212/365) \times IR_n \times AV_n$$

where

n	= year	PPI	= prices paid by farmers index number
AV	= average value of the wintered animal in 1978 dollars	CFP	= average October choice calf price (n-1 = year before, \$/cwt.)
MP	= average May choice feeder price for an animal weighing W (\$/cwt.; computed in equations 10, 11 and 12)	CW	= weight of the calf October 15 (cwt.)
W	= weight of the animal on May 15 (cwt.)	ICW	= interest costs for wintering in 1978 dollars
		IR	= interest rate expressed as a decimal

Equation 15 determines the average value of the animal during the wintering period. Equation 16 arrives at the interest cost by multiplying the proportion of the year, the interest rate and the average value of the animal together.

Death loss was handled differently for wintering than it was for the cow-calf budgets. Rather than sell a portion of an animal, a charge was made to compensate for animal loss. The cost for death loss was computed on the average value of the animal with the following equation:

$$(17) \quad DLW_n = DLP \times AV_n$$

where

n	= year	DLP	= death loss proportion
DLW	= cost of death loss in 1978 dollars	AV	= average value of the wintered animal in 1978 dollars (computation shown in equation 15)

A 1% death loss percentage was used for wintering. The cost was computed using the average value of the animal to reflect the economic cost of the loss of an animal. The 1% figure assumes the animals were raised as calves on the farm. This is a larger death loss than normal for calves kept on the same farm but is less than the normal death loss for purchased shipped-in calves.

The other cash and non-cash costs for wintering a single steer or heifer are shown in Table 5. The Beef Cow Herd Planning Guide for 1978 was used as a reference in determining the costs shown in 1978 dollars (10).

Table 5. Wintering--Other Cash And Non-Cash Costs (1978 Dollars)

<u>Other Cash Costs</u>	
1. Mineral and salt	\$ 2.00
2. Veterinary and medicine	1.00
3. Electricity, fuel and repairs	4.00
4. Marketing (additional to calves)	<u>2.50</u>
Total other cash costs	\$ 9.50
<u>Non-Cash Costs</u>	
1. Labor 4.46 hours @ \$4/hour	\$17.84
2. Facility depreciation	<u>10.00</u>
Total non-cash costs	\$27.84
TOTAL OTHER CASH AND NON-CASH COSTS	\$37.34

Summaries of the prices, receipts and expenses for wintering can be found in Appendix C for steers and Appendix D for heifers.

### Summering Budgets

Budgets for summering short yearling steers were developed for 1949 through 1979. The partial budgets for summering assumed carrying the steers on pasture beginning May 15. The steers wintered at 0.5 and 1.0 lb./day rates of gain were summered with simulated sales July 15 and October 15. The heifers and steers wintered at 1.5 lb./day gain were assumed to be at weights heavier than would be desirable for summering on pasture. The rates of gain and weights used for the summering budgets are summarized in Table 6.

Table 6. Summary Of Rates Of Gain And Weights Used For The Summering Budgets

<u>Summer Sale Date</u>	<u>Winter Rate Of Gain</u> (lb./day)	<u>May 15 Beginning Weight</u> (lb.)	<u>Summer Rate Of Gain</u> (lb./day)	<u>Final Weight</u> (lb.)
July 15	0.5	531	1.6	628
July 15	1.0	637	1.4	722
Oct. 15	0.5	531	1.4	745
Oct. 15	1.0	637	1.2	820

The 0.2 lb./day difference in summering rates of gain between the steers wintered at 0.5 lb./day and 1.0 lb./day gain was due to compensatory gain considerations (7). Previous research shows that steers fed for low rates of gain will gain faster and more efficiently than those with higher rates of gain when both groups are equally fed a more liberal ration (16,23); in this context, the 0.2 lb./day difference is conservative. However, only one of the cited research studies specifically dealt with gain on pasture following a wintering feeding regime (14). The difference in rates of gain between the July 15 and October 15 sale dates was attributable to pasture quality considerations (4,21). Pasture in northern Minnesota is typically better during the early part of the pasturing season, resulting in higher rates of gains. Late summer gains vary greatly among years, depending on weather conditions, but would average less pulling down the overall rate of gain from May 15 to July 15.

The returns over cash costs and all costs for summering were computed using the following equations:

$$(18) \quad \text{ROCS}_n = \text{GMS}_n - \text{ICS}_n - \text{DLS}_n - \text{OCS}$$

$$(19) \quad \text{ROAS}_n = \text{ROCS}_n - \text{NCS}$$

where

n	= year	DLS	= death loss costs
ROCS	= summering returns over cash costs in 1978 dollars	OCS	= other cash costs
GMS	= gross margin	ROAS	= summering returns over all costs in 1978 dollars
ICS	= interest costs	NCS	= non-cash costs

The gross margins were determined using average May, July and October choice feeder steer prices. The computational procedure is illustrated by the following equations:

$$(20) \quad \text{SP}_n = [((\text{P2}_n - \text{P1}_n)/(\text{W2}_n - \text{W1}_n)) \times (\text{SW} - \text{W1}_n)] + \text{P1}_n$$

$$(21) \quad \text{GMS}_n = [(\text{SP}_n \times \text{SW}) - (\text{MP}_n \times \text{W})] \times 219/\text{PPI}_n$$

where

n	= year	P1,P2	= the average July or October feeder steer price for weight W1 and W2, respectively (\$/cwt.)
SP	= average July or October feeder price for a steer weighing SW (\$/cwt.)	GMS	= summering gross margin in 1978 dollars
W1,W2	= the average weights for the two weight categories nearest weight SW (lb.)	W	= weight of the steer on May 15 (lb.)
SW	= weight of the steer on July 15 or October 15 (lb.)	MP	= average May feeder steer price for an animal weighing W
		PPI	= prices paid by farmers index number

Equation 20 determines the July or October sale price for a steer of a specific weight by interpolating the price from those of the two nearest weight categories. The gross margin computation in equation 21 subtracts the May 15 value of the steer from the summering sale value and converts the difference into 1978 dollars.

Interest costs were computed on the average value of the animal using the PCA's average cost of loans. The following equations were used for the computation:

$$(22) \quad AVS_n = [((MP_n \times W) + (SP_n \times SW)) \times 219/PPI_n] / 2$$

$$(23) \quad ICS_n = (DAYS/365) \times IR_n \times AVS_n$$

where

n	= year	SW	= weight of the steer July 15 or October 15
AVS	= average value of the summered steer	PPI	= prices paid by farmers index number
MP	= average May feeder price for a steer weighing W	ICS	= summering interest cost in 1978 dollars
W	= weight of the steer May 15	DAYS	= the number of days in the summering period
SP	= average July or October feeder steer price for a steer weighing SW	IR	= interest rate expressed as a decimal

Equation 22 determines the average value of the steer in 1978 dollars. In equation 23, the proportion of a year, the annual interest rate, and the average value of the steer were multiplied together to arrive at summering interest cost.

Death loss was computed in the same manner as in the wintering budgets. The death loss percents used in the summering budgets were 0.2% and 0.5% for July 15 and October 15 sales respectively. The following equation was used to compute the cost of death loss:

$$(24) \quad DLS_n = DLP \times AVS_n$$

where

n	= year	DLP	= death loss percent expressed as a decimal
DLS	= summering death loss cost in 1978 dollars	AVS	= average value of the summered steer in 1978 dollars (equation 22)

The cost of death loss was computed on the average value of the animal calculated from equation 22. The death loss percentages assumed the animal was wintered on the same farm.

The other cash and non-cash costs are summarized in Table 7.

Table 7. Summering--Other Cash And Non-Cash Costs (1978 Dollars)

	<u>July 15</u> <u>Sale</u>	<u>October 15</u> <u>Sale</u>
<u>Other Cash Costs</u>		
1. Mineral and salt	\$ .80	\$ 2.00
2. Veterinary and medicine	.50	1.00
3. Repairs, power and fuel	.60	1.50
4. Marketing (additional to wintering costs)	.50	1.25
5. Miscellaneous	<u>.50</u>	<u>1.00</u>
Total other cash costs	\$ 2.90	\$ 6.75
<u>Non-Cash Costs</u>		
1. Labor 0.81 & 2.03 hr. @ \$4/hr.	\$ 3.24	\$ 8.12
2. Pasture 2 & 5 months @ \$4/month	<u>8.00</u>	<u>20.00</u>
Total non-cash costs	\$11.24	\$28.12
<b>TOTAL OTHER CASH AND NON-CASH COSTS</b>	<b>\$14.14</b>	<b>\$34.87</b>

Summaries of the prices, receipts and expenses for summering can be found in Appendix E.

## CHAPTER III

### THE SIMPLE MODEL -- RESULTS AND DISCUSSION

Returns over cash costs were generated for several different beef programs. The results for each of these programs are discussed below. Yearly returns over directly associated cash costs and the market value of home-produced feed (other than pasture) are shown for each program.

Means, standard deviations and the percent of years that returns over cash costs (including all feed) and returns over all costs greater than zero are given for the 31-year period and for a 28-year period which excludes the "bust" years of 1953, 1964 and 1974. Calculations for the shorter period are included because the large losses of the bust years have a large influence on the 31-year averages. Also, since these years are to some degree predictable, the astute manager can make production/marketing adjustments to partially protect earnings (11).

#### Returns To The Cow-Calf Enterprise

Net returns by year for the cow-calf enterprise are shown in Table 8. Note the regular occurrence of low returns during the middle of each decade. Cattle numbers increased rapidly in the early 1950s following a trend started after World War II. With record profits and large numbers of replacements held from the market, the most rapid annual growth rates in the national cow herd occurred in 1952 and 1953. Increased beef supplies brought about a sudden negative break in prices in 1953, followed by four years of low returns. Prices remained low during that period because of increased female slaughter and subsequent large beef supplies.

Following the reduction in cattle numbers, returns to the cow herd jumped to a relatively high level in 1957 and 1958. This initiated a period of beef cattle expansion with fairly stable returns through 1963. The rate of increase in beef production was not as rapid during this growth phase of the 1960s as it was during the growth phase of the 1950s. Therefore, the price break in 1964 was not as severe and losses were not as great as those sustained earlier. Therefore, instead of dropping drastically, cattle numbers simply leveled off for a period until the demand for beef again caught up with beef supplies.

Returns gradually increased again in the late 1960s and early 1970s, encouraging another over-expansion in beef cow numbers. Increased beef supplies coupled with a decrease in demand during the high inflation period of 1973-74 led to a sharp price reduction in 1974 with cattle numbers at record levels. Also, feed prices increased dramatically at this same time because of the large Russian grain purchase and the short 1974 U.S. crop. With record low real calf prices and high feed expenses, record losses were incurred from 1974 through 1977. Feeder producers again responded by sharply reducing beef cow numbers.

The historical returns for the cow-calf unit have shown a consistent pattern throughout the past three cattle cycles. Good returns during the transition and growth period of the cycle led to high cattle numbers and high beef production which in turn caused sharp breaks in cattle prices. This brought about herd liquidation with continued high beef supplies, causing returns to cow herds to be very low during the liquidation phase of the cycle. In the 1950s and 1970s both returns and cattle numbers rose to high levels. Following the price break in these two periods, four years of low returns were experienced. In the 1960s the returns preceding the bust year were not as high as in the other cycles, so the rate of herd expansion was not as great. Consequently, the price break was not as severe and returns rebounded more quickly than in the 1950s and 1970s. The decline in fall steer prices from calf prices of the year before was 27%, 20% and 55% for 1953, 1964 and 1974 respectively. The decline in the 1950s actually was more severe than indicated by the 27% figure because a significant decline in prices had occurred already the year before. The decline over the two year period was 56%. (See Appendix B for steer calf prices in 1978 dollars.)

Table 8 shows returns per cow for three different levels of calf crop--75%, 85% and 95%. Typical herds show 85% while well-managed herds maintain a 95% or better calving rate. The percent calf crop was computed using the number of calves available for sale in the fall (including the replacement heifers) and the average number of cows fed through the year.

Table 8. Returns Over Feed And Cash Costs For The Cow-Calf Unit (1978 Dollars)

Year	----- Calf Crop -----		
	75%	85%	95%
1948	\$ 26.49	\$ 56.82	\$ 87.15
1949	17.39	46.30	75.12
1950	83.80	121.71	159.62
1951	155.01	198.62	242.23
1952	42.76	72.10	101.44
1953	-8.95	11.74	32.42
1954	-17.69	2.37	22.43
1955	-11.69	9.06	29.81
1956	-12.77	7.92	28.61
1957	41.51	67.63	93.75
1958	92.17	126.25	160.34
1959	42.27	73.62	104.96
1960	24.14	50.92	77.70
1961	35.94	63.88	91.83
1962	53.73	83.50	113.27
1963	41.52	69.04	96.56
1964	-27.10	-5.19	16.71
1965	-1.50	21.72	44.94
1966	29.13	54.98	80.83
1967	15.42	40.18	64.94
1968	21.04	45.84	70.65
1969	43.16	71.04	98.92
1970	46.24	74.41	102.58
1971	56.26	83.68	111.10
1972	94.56	128.49	162.43
1973	88.66	124.79	160.91
1974	-97.62	-81.63	-65.64
1975	-87.34	-71.92	-56.50
1976	-134.80	-119.38	-103.95
1977	-46.82	-28.73	-10.65
1978	43.82	71.61	99.40
<u>31 Year Statistics</u>			
Mean	\$20.93	\$47.46	\$74.00
Standard deviation	59.21	65.47	71.79
% years returns over cash costs > zero	68%	84%	87%
% years returns over all costs > zero <sup>a/</sup>	13%	16%	48%
<u>28 Year Statistics</u> (excluding 1953, 1964 and 1974)			
Mean	\$28.26	\$55.57	\$82.88
Standard deviation	56.38	62.44	68.57
% years returns over cash costs > zero	75%	89%	89%
% years returns over all costs > zero <sup>a/</sup>	14%	18%	54%

a/ An additional \$88.00 was deducted for non-cash costs

The economic importance of the size of the calf crop is quite evident from these historical budget results. The average returns over cash costs for the 31 years were \$20.93, \$47.46 and \$74.00 for the three calving rates. Each 1 percentage point change in the calf crop translates into an average \$2.65 change in gross returns per cow.

Note that the risk of loss from a beef cow herd can be greatly decreased by improved production management. The 95% calf crop herd failed to cover cash costs and feed value in only 13% of the years compared to 32% for the 75% calf crop herd. All costs were covered in about one-half the years for the 95% calf crop herd compared to less than one-fifth of the time for the other two efficiency levels.

#### Returns To Wintering

The wintering program carries steers and heifers through the winter at three different rates of gain. Returns to these programs are shown in Tables 9 and 10. For steers gaining 1.5 pounds per day, losses were incurred in 1953, 1963, 1964 and 1974 - 1976. The losses occurred in the price break year and the following year or two, and were quite substantial. At lower rates of gain, losses were greater and were sustained longer. For steers wintered at 0.5 lb./day gain (the normal gain when steers are wintered on a hay-only ration) returns over feed and cash costs were greater than zero in only 32% of the years.

Returns to wintering appeared to be consistently good during the transition and expansion phases of the cattle cycle. Following the bust years, returns recovered to good levels and then decreased significantly before reaching excellent levels in 1958 and 1969. In the 1970s returns increased steadily, reaching excellent levels in 1978. Similar patterns were seen for both steers and heifers.

Heifers did not show quite as much profit as steers during the past 31 years. For example, the 31-year average return for heifers was \$16.42 compared with \$36.63 for steers with gains of 1.5 lb./day. Returns over cash costs were greater than zero in 74% of the years for heifers compared with 81% for steers. This can be explained in part by higher feed expenses for heifers and higher price discounts during the liquidation phase of the cycle when heifer feeders are in surplus. Returns were consistently positive during the expansion phase for heifers, but during the bust years and subsequent liquidation phase losses were large and consistent. This longer period of low return is due in part to the fact that there is a relative oversupply of heifer feeders during the liquidation phase of the cattle cycle, when relatively few are kept for herd replacements.

When the three simulated rates of gain are compared, it is obvious that the 1.5 lb./day rate of gain yielded consistently the highest returns for both steers and heifers, with the highest mean returns and the greatest returns in almost every year. It is more profitable to feed for higher rates of gain because the amount of feed above that required for maintenance is converted to gain very efficiently (6). However, if feeders are to be pastured the following summer, winter gains might best be held to about 1.25 lb./day; otherwise, animal weights may be too high for effective use of pasture.

#### Returns To Summering

Tables 11 and 12 show returns over cash costs to pasture programs for steers, plus returns to different combinations of winter-summer programs. No pasture program was calculated for heifers, since heifers wintered to gain a pound or more per day will likely be too heavy to summer on pasture.

Returns over cash costs in a summering program represent a return to pasture land as well as to labor, risk and management. They averaged quite high over the past three cycles and showed a pattern similar to wintering returns, except they were more sporadic. During 1960 and 1961, and again in 1979, low returns appeared during the expansion phase of the cycle when wintering returns were favorable.

Summering returns were excellent during the years following price break years, when returns to the cow-calf unit were low or negative. Even in 1957, when wintering returns were negative, the returns to summering more than compensated for wintering losses. This suggests that feeder producers should shift to yearling programs in the bust year (i.e. retain calves after their price has dropped sharply) in order to avoid part of the bust year losses that hit feeder calf producers.

Table 9. Returns Over Feed And Cash Costs For Wintering Steers (1978 Dollars)

Year	----- Rate Of Gain (lb./day) <sup>a/</sup> -----		
	0.5	1.0	1.5
1949	\$ -1.48	\$ 41.40	\$ 69.45
1950	36.31	81.58	113.10
1951	25.93	81.39	126.14
1952	-70.88	-18.33	24.30
1953	-77.22	-54.35	-45.30
1954	-19.37	31.03	67.89
1955	5.48	35.31	55.11
1956	-28.37	0.11	11.32
1957	0.45	49.18	67.56
1958	47.16	95.15	118.04
1959	-22.08	16.27	40.79
1960	-44.48	0.04	24.64
1961	-35.64	2.53	25.59
1962	-20.09	16.09	35.83
1963	-45.75	-21.24	-6.85
1964	-94.57	-75.49	-68.98
1965	-25.51	6.35	28.68
1966	5.13	35.04	59.82
1967	-37.20	-7.94	14.91
1968	-24.34	4.22	29.36
1969	20.65	60.75	90.22
1970	-3.31	30.12	48.03
1971	-24.46	14.53	41.44
1972	9.19	34.53	60.18
1973	-0.45	36.77	44.19
1974	-188.55	-176.02	-168.43
1975	-67.82	-40.08	-11.80
1976	-49.44	-20.74	-0.42
1977	-12.41	12.99	30.81
1978	45.05	83.00	111.51
1979	38.57	67.58	98.45
<u>31 Year Statistics</u>			
Mean	\$-21.27	\$13.61	\$36.63
Standard deviation	47.47	53.62	59.07
% years returns over cash costs > zero	32%	74%	81%
% years returns over all costs > zero <sup>b/</sup>	13%	45%	65%
<u>28 Year Statistics</u>			
Mean	\$-10.68	\$25.99	\$50.65
Standard deviation	32.19	35.20	38.12
% years returns over cash costs > zero	36%	82%	89%
% years returns over all costs > zero <sup>b/</sup>	14%	50%	71%

a/ See Table 4 for winter feed requirements for each rate of gain

b/ An additional \$37.34 was deducted for non-cash costs



Table 10. Returns Over Feed And Cash Costs For Wintering Heifers (1978 Dollars)

Year	----- Rate Of Gain (lb./day) -----		
	0.5	1.0	1.5
1949	\$-15.14	\$ 11.44	\$ 24.77
1950	22.51	55.65	76.05
1951	7.27	42.56	61.58
1952	-50.44	-37.51	-46.74
1953	-88.57	-77.31	-77.75
1954	-6.93	-2.44	-11.10
1955	-3.96	12.33	19.13
1956	-36.29	-13.70	3.49
1957	-0.52	41.09	81.26
1958	22.91	55.07	77.22
1959	-9.20	29.13	55.94
1960	-38.59	1.96	35.69
1961	-24.40	9.89	37.19
1962	-16.88	14.87	37.65
1963	-61.73	-59.36	-73.19
1964	-83.90	-71.98	-70.90
1965	-38.70	-15.60	0.71
1966	3.65	31.33	50.63
1967	-40.76	-14.81	3.01
1968	-27.93	-2.67	44.90
1969	16.99	47.64	69.15
1970	1.21	22.49	39.45
1971	-29.97	-4.79	10.37
1972	5.14	23.35	35.50
1973	-5.88	15.30	25.16
1974	-173.83	-166.85	-169.96
1975	-71.84	-50.17	-27.62
1976	-56.25	-26.92	-6.37
1977	-20.15	0.05	18.94
1978	42.33	73.43	99.38
1979	34.51	63.68	85.43
<u>31 Year Statistics</u>			
Mean	\$-24.04	\$ 0.23	\$16.42
Standard deviation	43.05	49.30	57.99
% years returns over cash costs > zero	29%	58%	74%
% years returns over all costs > zero <sup>a/</sup>	6%	29%	48%
<u>28 Year Statistics</u>			
Mean	\$-14.25	\$11.55	\$29.56
Standard deviation	29.02	33.44	40.74
% years returns over cash costs > zero	32%	64%	82%
% years returns over all costs > zero <sup>a/</sup>	7%	32%	54%

a/ An additional \$37.34 was deducted for non-cash costs

Table 11. Summering And Combination Wintering And Summering Returns Over Cash Costs - Steers - July 15 Sale (1978 Dollars)

Year	<u>Low Winter Rate Of Gain</u>		<u>High Winter Rate Of Gain</u>	
	<u>Summer</u>	<u>Combination</u>	<u>Summer</u>	<u>Combination</u>
	----- Winter/Summer Rate Of Gain (lb./day) -----			
	(0.5/1.6)	(0.5/1.6)	(1.0/1.4)	(1.0/1.4)
1949	\$ 13.06	\$ 11.58	\$ 7.83	\$ 49.23
1950	65.71	102.02	65.78	147.36
1951	82.39	108.32	83.76	165.15
1952	11.41	-59.47	3.99	-14.34
1953	8.13	-69.09	6.83	-47.52
1954	37.03	17.66	14.94	45.97
1955	33.87	39.35	29.45	64.76
1956	20.54	-7.83	13.56	13.67
1957	62.15	62.60	40.75	89.93
1958	37.52	84.68	22.14	117.29
1959	32.31	10.23	30.48	46.75
1960	15.64	-28.84	5.78	5.82
1961	19.03	-16.61	3.06	5.59
1962	32.36	12.27	21.76	37.85
1963	32.07	-13.68	31.49	10.25
1964	24.70	-69.87	23.09	-52.40
1965	46.62	21.11	44.47	50.82
1966	27.22	32.35	26.10	61.14
1967	39.08	1.88	40.47	32.53
1968	40.88	16.54	41.20	45.42
1969	40.06	60.71	35.33	96.08
1970	33.00	29.69	24.41	54.53
1971	36.97	12.51	29.29	43.82
1972	52.68	61.87	52.78	87.31
1973	59.81	59.36	47.48	84.25
1974	-27.35	-215.90	-29.83	-205.85
1975	21.97	-45.85	21.89	-18.19
1976	14.88	-34.56	2.12	-18.62
1977	20.46	8.05	18.98	31.97
1978	50.83	95.88	31.23	114.23
1979	8.79	47.36	7.79	75.37
<u>31 Year Statistics</u>				
Mean	\$32.06	\$10.78	\$25.75	\$39.36
Standard deviation	20.99	63.69	21.45	68.75
% years returns over cash costs > zero	97%	68%	97%	81%
% years returns over all costs > zero <sup>a/</sup>	90%	32%	74%	58%
<u>28 Year Statistics</u>				
Mean	\$35.30	\$24.61	\$28.51	\$54.50
Standard deviation	18.02	43.91	19.38	46.87
% years returns over cash costs > zero	100%	75%	100%	89%
% years returns over all costs > zero <sup>a/</sup>	96%	36%	79%	64%

a/ An additional \$11.24 was deducted for non-cash costs

Table 12. Summering And Combination Wintering And Summering Returns Over Cash Costs - Steers -  
October 15 Sale (1978 Dollars)

Year	<u>Low Winter Rate Of Gain</u>		<u>High Winter Rate Of Gain</u>	
	<u>Summer</u>	<u>Combination</u>	<u>Summer</u>	<u>Combination</u>
	----- (0.5/1.4)	----- (0.5/1.4)	----- Rate Of Gain (lb./day) (1.0/1.2)	----- (1.0/1.2)
1949	\$ 82.44	\$ 80.96	\$ 61.43	\$102.83
1950	179.20	215.51	164.79	246.37
1951	184.60	210.53	162.22	243.61
1952	29.25	-41.63	-.11	-18.44
1953	46.42	-30.80	28.62	-25.73
1954	108.31	88.94	73.82	104.85
1955	78.17	83.65	62.01	97.32
1956	94.72	66.35	83.50	83.61
1957	127.56	128.01	99.71	148.89
1958	111.09	158.25	76.31	171.46
1959	46.36	24.28	29.41	45.68
1960	42.54	-1.94	17.66	17.70
1961	106.19	70.55	80.34	82.87
1962	108.59	88.50	87.68	103.77
1963	68.90	23.15	56.79	35.55
1964	57.30	-37.27	50.75	-24.74
1965	105.28	79.77	95.65	102.00
1966	70.82	75.95	54.37	89.41
1967	75.33	38.13	62.80	54.86
1968	79.34	55.00	64.10	68.32
1969	53.35	74.00	29.25	90.00
1970	41.33	38.02	16.09	46.21
1971	80.58	56.12	61.06	75.59
1972	121.16	130.35	118.22	152.75
1973	100.62	100.17	78.17	114.94
1974	14.99	-173.56	5.93	-170.09
1975	100.77	32.95	87.26	47.18
1976	26.45	-22.99	8.71	-12.03
1977	46.56	34.15	32.29	45.28
1978	113.33	158.38	86.00	169.00
1979	36.46	75.03	26.72	94.30
<u>31 Year Statistics</u>				
Mean	\$81.86	\$60.60	\$63.28	\$76.88
Standard deviation	40.84	77.37	40.44	81.38
% years returns over cash costs > zero	100%	81%	97%	84%
% years returns over all costs > zero <sup>a/</sup>	94%	58%	81%	61%
<u>28 Year Statistics</u>				
Mean	\$86.40	\$75.72	\$67.01	\$93.00
Standard deviation	39.96	60.98	40.38	63.70
% years returns over cash costs > zero	100%	89%	96%	93%
% years returns over all costs > zero <sup>a/</sup>	96%	64%	82%	68%

a/ An additional \$28.12 was deducted for non-cash costs

The 31-year averages show combination winter-summer returns to be highest when steers were wintered at 1.0 lb./day rate of gain. Although the rate of gain on pasture was lower than that following winter gains of only 0.5 lb./day, the combination returns were higher. Thus, the "hay only" ration with gains of about 0.5 lb./day can rarely be justified, even when calves are held over for a pasture program. The pattern of returns was similar for July 15 and October 15 sale, although returns to the October 15 sale were generally higher. Of course, actual results could be different for a specific year in which a drought resulted in pasture shortage after July 15.

### Conclusions

The patterns of returns observed during the past three cattle cycles for the cow-calf unit and the feeder alternatives lend themselves to several possible production/marketing strategies which could potentially increase profits for the feeder cattle producer. Two possible strategies, varying the herd size and changing the type of feeder production program followed during different phases of the cattle cycle, were considered.

The pattern of returns to the cow-calf enterprise during the past three cattle cycles suggests a counter-cyclical herd size, inversely related to cattle numbers, as a strategy to increase long-term profits. When the peak in cattle numbers and a price break appears to be imminent, the producer could reduce or liquidate the cow herd while prices are still good to minimize total losses when the price break occurs. Culling the oldest and least productive cows would leave a good base for rebuilding the herd. During the liquidation phase of the cycle when the national herd size is being reduced and prices are depressed, the herd could be expanded to full capacity by retaining most heifers. Rebuilding or restocking the herd during the time of depressed prices would put the beef enterprise in position to take full advantage of the excellent profit potential during the expansion phase of the cattle cycle while minimizing cattle sales during the low price period.

This strategy is just the opposite of that followed by most producers in the course of a cattle cycle. The typical producer expands when returns are good and liquidates after the negative price break and significant losses have been incurred. With the strategy suggested above, the prudent manager could take advantage of this situation. Cows could be sold at high prices prior to the price bust, and repurchased (or obtained via the retention of more replacement heifers) during the liquidation phase when prices are low.

The partial budget returns to wintering and summering suggest some periods in the cattle cycle when one production alternative yields returns superior to the others. Calves should be marketed in the fall of the year prior to the bust year since wintering and summering these animals would have produced losses in all three cycles. Even though the year can't be anticipated correctly, calf sales can be started a year early with near maximum returns. Heifers produced in the bust year and the following two years should also be marketed as calves. Wintering heifers during this period of the liquidation phase yielded negative returns in all three cycles.

Wintering steers generally showed favorable returns during the expansion phase of the cycle. For steers gaining 1.5 lb./day, returns were greater than all costs during 71% of the non-bust years. Looking only at the expansion phase of the cycle, returns fell below cash costs only in 1963. Average returns to wintering heifers were lower than those to steers, but returns were at high levels during the expansion phase. Therefore, feeder cattle producers would be betting on very favorable odds by retaining all their feeders through the winter during the expansion phase of the cycle.

Summering returns follow a less discernible pattern than wintering returns. It was evident, however, that they do recover quickly after a bust year. In all three cycles, returns to summering were excellent the year following the price break. This would suggest steer calves produced in the bust year should be wintered and summered to increase profits. Returns to summering alone were generally positive, but the summering alternative is in direct competition with the cow herd for pasture resources.

By incorporating varied herd size and alternative production strategies, a clearer scenario for an integrated production/marketing strategy can be developed. Reducing the size of the cow herd prior to the bust year and expanding it during the liquidation phase of the cycle would leave some pasture resources unused for a few years. Summering returns rebound quickly following the price bust and show good profit potential during the liquidation phase. Steers could be wintered and summered during the period until the cow herd is again expanded enough to require all the pasture resources. In addition, during rapid herd expansion a large proportion of the heifers produced must be retained as replacement

stock. Therefore, only a small portion of the heifers need be marketed during the liquidation phase when returns to wintering heifers are poor. After the herd is expanded, both heifers and steers could be wintered until the next price break is imminent. (Although price breaks have occurred one or two years before the middle of each decade in the past several cycles, cycle indicators need to be monitored to suggest when the shift to fall calf sales should occur. (11) )

When calves will be wintered only (short yearlings to be sold in spring), they should be fed for a gain of 1.5 lb./day or greater, since historical returns clearly demonstrate that higher rates of gain are more profitable when feeders do not go to pasture. If calves will be summered following the bust year, it is advisable to feed for a somewhat lower rate of gain (1.0 - 1.3 lb./day) than if they were wintered only.

The wintering program does not compete for pasture resources. Depending on the farm situation, wintering may be in direct competition with other feed and wintering needs; however, facilities for wintering need not be extravagant. And, purchase of feed is usually possible at reasonable prices in northern Minnesota if enough has not been grown on the farm.

Summering is in direct competition with the cow herd for pasture resources. Depending in part on the type of pasture, there usually is more forage available during the first part of the summer. The summering alternative with the July 15 sale was developed to utilize the additional forage available during that period. The individual farm situation and the rainfall pattern in a particular year will determine which summering alternative is most feasible. In many cases it may be the best strategy to sell off a portion of the heavier steers when the pasture carrying capacity declines in mid-summer.

The simple budget results in this chapter suggested some strategies to use in coping with the cattle cycle. However, it is difficult to determine from this analysis the magnitude of changes in cow herd size or the proportion of feeders to be overwintered and/or kept for pasture required to maximize returns to pasture and hayland resources. The next two chapters will address these questions using a more complex computer model.

## CHAPTER IV

### THE LINEAR PROGRAMMING MODEL--PROCEDURES AND ASSUMPTIONS

To determine the "perfect" marketing strategy for the 31 years of budgets shown in Chapter 3, a linear program (LP) matrix was developed. In this model the producer was assumed to have perfect foresight of returns from the various marketing alternatives over the course of 31 years. The producer was limited in that cows could not be purchased; thus, after a herd was reduced it could only be rebuilt from raised heifers. The model also assumes that pasture acres remained the same for the entire 31 years.

Marketing alternatives considered were October and May sales for steers and heifers, and sale of the yearling steers from pasture in either July or October. The LP also included budgets for cows, replacement stock, and cull cow sales. The only resource limited was pasture from May 15 through July 15 and from July 16 through October 15.

#### Linear Programming Matrix

The LP matrix was designed assuming an average 85% calf crop and death losses of 1% for wintering, 0.2% for the July 15 summer sale, 0.5% for the October 15 summer sale, and 2% yearly for the cow herd. A 15% minimum replacement rate was used in the matrix to ensure that the cow herd was kept at a "normal" age. This simplifying assumption means that even in a year in which heavy culling occurs, 15% of the herd is replaced with heifer stock.

The matrix consisted of 31 annual matrices interconnected with transfer vectors for the cows and replacement stock. Table 13 shows slightly more than two years of the matrix. The pattern is repetitive throughout the entire matrix with only the objective function changing.

The production and flow of animals from a single cow assumed by the model is shown in Table 14. The steers produced can be marketed at four alternative dates and heifers can be marketed at two alternative dates. Heifers can also be saved as replacement stock. A heifer produced in year  $n$  enters the herd in year  $n+1$  and produces a calf in year  $n+2$ .

The STCT and HFCT transfer vectors control the flow of the calves into the alternative sale dates, and, for heifers, into the replacement stock alternative. Death loss and percent calf crop considerations have been included in the coefficients of these vectors.

The COWT and REPC vectors control the transfer of the cow herd between years. For example, the COW54 alternative gives .98 and the REPH54 alternative gives 1.0 to the COW54-55 transfer vector. The CULL54 and COW55 alternatives then are each able to take 1.0 from the COW54-55 vector. The REPC control vector requires that for every COW55 there are .15 REPH54s. Therefore, a minimum 15% of the total number of cows in 1955 will be replacement heifers from 1954.

The MY-JL and JL-OT vectors control the maximum allowable animal unit months (AUM) of pasture from May 15 through July 15 and from July 16 through October 15. Cows require 1.0 AUM per month and yearlings require 0.7 AUM per month while on pasture; there are two months in MY-JL and three months in JL-OT.

The maximum AUMs available in each period was computed based on 300 acres of rotationally grazed native bluegrass pasture in northern Minnesota. Four years of data from two farms in north-eastern and northwestern Minnesota were averaged to arrive at the average AUMs per acre per period (4). These amounts were then multiplied by 300 acres to arrive at 154 AUMs of pasture for May 15 through July 15 and 265 AUMs of pasture for July 16 through October 15.

Table 13. Linear Programming Matrix

Alternatives	COW53	SC53	HC53	CULL53	REPH54	WH54	WS54	SSJL54	SSOT54	COW54
Objective Function	-145.85	229.81	183.85	275.51	-179.96	175.04	301.05	279.56	339.76	-149.01
<u>Resources - Rows</u>										
COWT52-53	1.0									
MY-JL53	2.0									
JL-OT53	3.0									
COWT53-54	-0.98			1.0						1.0
STCT53-54	-0.425	1.0					1.01	1.012	1.015	
HFCT53-54	-0.425		1.0		1.015	1.01				
REPC52-53	0.15									
MY-JL54					1.4			1.4	1.4	2.0
JL-OT54					2.1				2.1	3.0
COWT54-55					-1.0					-0.98
STCT54-55										-0.425
HFCT54-55										-0.425
REPC53-54										0.15
MY-JL55										
JL-OT55										
COWT55-56										
STCT55-56										
HFCT55-56										
REPC54-55					1.0					
MY-JL56										
JL-OT56										
REPC55-56										

Alternatives	SC54	HC54	CULL54	REPH55	WH55	WS55	SSJL55	SSOT55	COW55	
Objective Function	222.69	178.44	258.21	-180.28	199.99	281.02	291.19	325.03	-150.11	
<u>Resource - Rows</u>										
COWT52-53										
MY-JL53										
JL-OT53										
COWT53-54										
STCT53-54										
HFCT53-54										
REPC52-53										
MY-JL54										
JL-OT54										
COWT54-55			1.0							1.0
STCT54-55	1.0					1.01	1.012	1.015		
HFCT54-55		1.0		1.015	1.01					
REPC53-54										
MY-JL55				1.4			1.4	1.4	2.0	
JL-OT55				2.1				2.1	3.0	
COWT55-56				-1.0						-0.98
STCT55-56										-0.425
HFCT55-56										-0.425
REPC54-55										0.15
MY-JL56										
JL-OT56										
REPC55-56				-1.0						

Table 13. Linear Programming Matrix (continued)

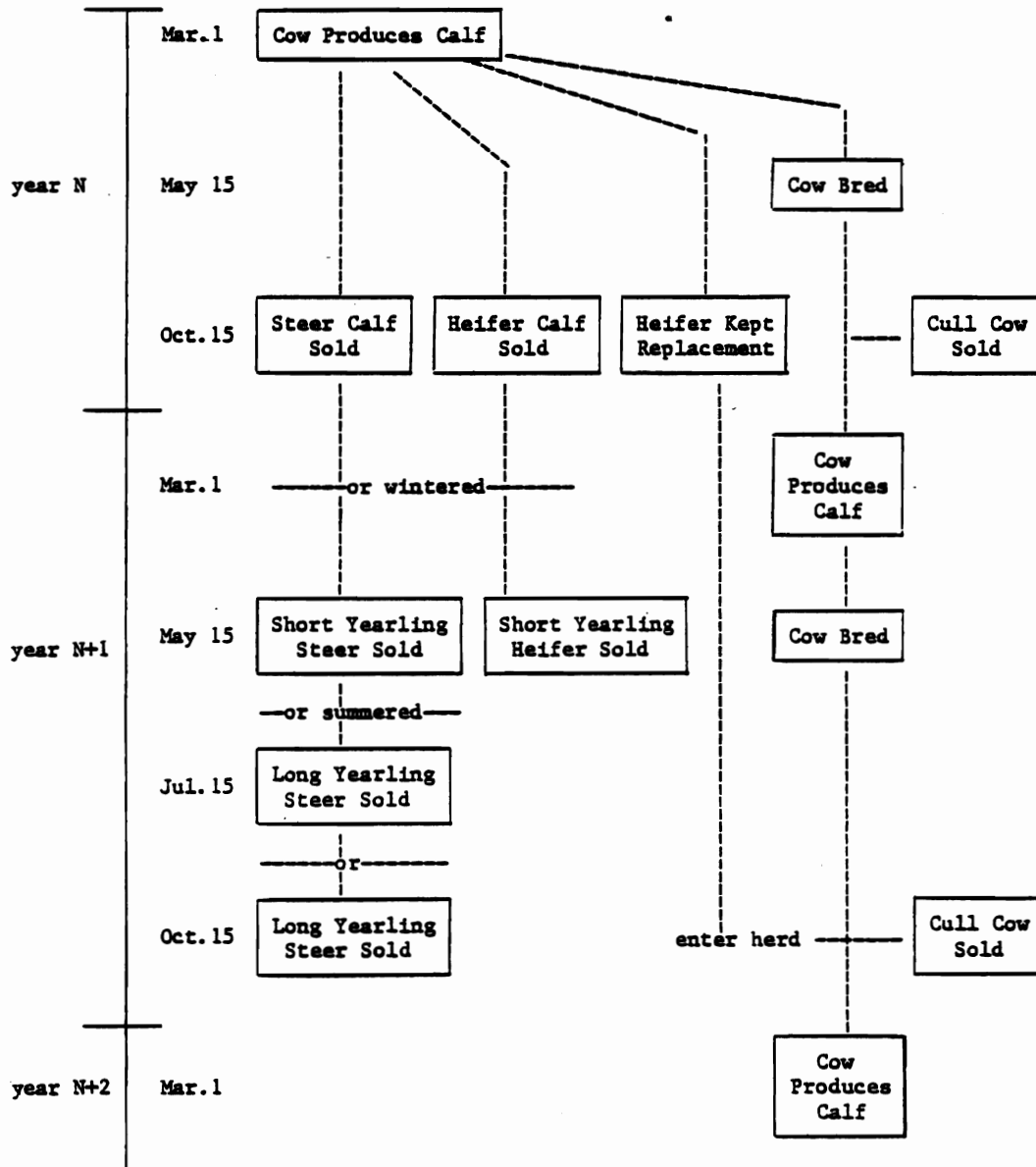
Alternatives

COW = maintaining one cow for a year  
 SC = selling a steer calf  
 HC = selling a heifer calf  
 CULL = selling a cull cow  
 REPH = producing a replacement heifer to enter the herd  
 WH = wintering a heifer and selling it in the spring  
 WS = wintering a steer and selling it in the spring  
 SSJL = wintering and summering a steer until July and then selling it  
 SSOT = wintering and summering a steer until October and then selling it

Rows

COWT = cow herd transfer vector  
 STCT = steer calf transfer vector  
 HFCT = heifer calf transfer vector  
 REPC = minimum replacement control vector  
 MY-JL = maximum animal unit months of pasture from May 15 through July 15  
 JL-OT = maximum animal unit months of pasture from July 16 through October 15

Table 14. Animal Flow Calendar





### Objective Function

Returns over cash costs were used in the objective function of the LP matrix. The budgets used were the same as those explained earlier except for minor modifications in allocation of expenses and receipts among alternatives. The cow-calf unit was broken into the following component parts: 1) yearly cow budget, 2) replacement budget, 3) sell cull cows, 4) sell steer calf and 5) sell heifer calf.

The marketing alternatives used in the matrix were selected based on the best average returns-above-cash costs from the various rates of gain. Steers and heifers wintered at 1.5 lb./day rates of gain were used as the wintering alternatives in the matrix. For the summering alternatives, steers wintered at 1.0 lb./day gain were selected because the combined returns were higher than for the steers wintered at .5 lb./day. The corresponding summer rates of gain were 1.4 lb./day and 1.2 lb./day for July and October sales, respectively.

The budget for a single cow was computed using the following equations:

$$(25) \quad FE_n = (2.57 \times PH_n) \times 219/PPI_n$$

$$(26) \quad IC_n = (10.0 \times ACCP_n \times IR_n) \times 219/PPI_n$$

$$(27) \quad ROC_n = -(FE_n + IC_n + OC)$$

where

<p>n = year          FE = annual feed expenses in 1978 dollars          PH = price of hay (\$/T)          PPI = prices paid by farmers index number          IC = annual interest costs in 1978 dollars</p>	<p>ACCP = average annual utility cow price (\$/cwt.)          IR = interest rate expressed in decimal          ROC = cash costs in 1978 dollars for one cow          OC = other cash costs</p>
---	--

The annual feed requirement of 2.57 T of alfalfa-bromegrass hay is taken from Table 2. The interest cost is computed on a 1,000-lb. cow valued using the annual average utility cow price. Other cash costs are found in Table 3. For the cow alone, these costs were calculated at \$30.30 (determined by deducting the replacement and cull cow shares from the total for the complete cow-calf unit).

A portion of the replacement budget was included in computations for the cow-calf unit. The following equations were used to determine the cash costs for one replacement heifer:

$$(28) \quad FER_n = [(1.5 \times PH_n) + (22.12 \times PC_n)] \times 219/PPI_n$$

$$(29) \quad ICR_n = [(RP_n \times 871) + (HCP_{n-1} \times 4.0)]/2 \times IR_n \times 219/PPI_n$$

$$(30) \quad ROCR_n = -(FER_n + ICR_n + OCR)$$

where

<p>n = year          FER = replacement feed expense in 1978 dollars          PH = price of hay (\$/T)          PC = price of corn (\$/bu.)          PPI = prices paid by farmers index number          ICR = replacement interest cost in 1978 dollars</p>	<p>RP = average October choice heifer price for an animal weighing 871 lbs. (\$/cwt., see equation 6)          HCP = heifer calf price (n-1 = the year before, \$/cwt.)          IR = interest rate expressed in decimal          ROCR = cash costs in 1978 dollars for one replacement          OCR = other cash costs for a replacement</p>
--	---

The derivation of feed requirements was explained earlier. For the cow-calf unit only 15% of the replacement feed requirement was used. The interest, computed in equation 29, is based on the average value of the animal using average October choice heifer and heifer calf prices. The calf price used was from a year earlier. The other cash costs for a replacement are shown in Table 15.

Table 15. Other Cash Costs For A Replacement Heifer (1978 Dollars)

<u>Wintering</u>		<u>Summering</u>	
1. Mineral and salt	\$2.00	1. Mineral and salt	\$2.00
2. Breeding fees or bull	6.50	2. Veterinary and medicine	1.00
3. Veterinary and medicine	3.00	3. Repairs, power and fuel	1.50
4. Repairs, power and fuel	<u>4.00</u>	4. Miscellaneous	<u>1.00</u>
Total Other Cash Costs		\$21.00	

The budgets for the steer and heifer calves were simply the weight times the price on October 15. Average October choice steer and heifer calf prices were used, and the steer and heifers were assumed to weigh 425 lb. and 400 lb., respectively. Assuming a 1000 lb. cow, the cull cow budget was determined using the average October utility price. A marketing charge of \$10 was deducted from the cull cow value to arrive at the matrix budget for the cull cow.

There were two modifications to the computations used earlier for the wintering and summering budgets. First, the charge for death loss was not deducted because factors for death loss were included in the transfer vectors in the matrix. The second change was made in the gross margin computation. Instead of computing a gross margin, the sale value in 1978 dollars was used to allow returns on a calf to be computed for the entire period so that transfer vectors from alternative to alternative were not necessary. The summering budget, for example, included the same value minus costs for wintering and summering, and no charges were deducted for the value of the animal. More detailed explanations of assumptions and computations for wintering and summering can be found in the earlier discussion.

The cash costs and returns over cash costs that were used in the objective function of the matrix are shown in Table 16. They are the results of procedures explained above and in the earlier discussions. The LP matrix was solved using APEX-I on a Cyber 74 at the University of Minnesota (3,8).

Table 16. Linear Programming Budgets<sup>a/</sup> (1978 Dollars)

<u>Year</u>	<u>Cow Budget<sup>b/</sup></u>	<u>Replacement Budget<sup>b/</sup></u>	<u>Cull Cow Budget<sup>c/</sup></u>	<u>Steer Calf Budget<sup>c/</sup></u>	<u>Heifer Calf Budget<sup>c/</sup></u>
1948	\$-196.47	\$ --	\$517.91	\$318.41	\$288.16
1949	-186.09	-202.73	431.90	306.00	272.16
1950	-191.67	-215.01	585.68	397.37	360.91
1951	-165.65	-190.75	624.30	468.33	403.81
1952	-160.91	-191.14	393.59	313.57	272.23
1953	-145.85	-186.12	272.51	229.81	183.85
1954	-149.01	-179.96	258.21	222.69	178.44
1955	-150.11	-180.28	278.21	233.84	181.15
1956	-150.18	-173.14	267.67	230.39	183.42
1957	-141.68	-145.05	337.79	283.66	238.81
1958	-151.47	-154.31	439.20	366.89	314.75
1959	-174.25	-166.63	369.85	340.42	286.46
1960	-164.06	-153.16	335.92	291.71	243.89
1961	-158.56	-159.32	357.07	300.59	258.32
1962	-150.72	-157.44	354.51	316.97	278.37
1963	-148.12	-152.84	335.59	296.61	253.85
1964	-173.74	-170.91	286.36	235.82	202.34
1965	-163.72	-160.18	325.26	254.87	209.59
1966	-156.27	-155.40	377.50	276.38	240.63
1967	-162.35	-151.72	358.80	268.43	226.80

Table 16. Linear Programming Budgets<sup>a/</sup> (1978 Dollars) - Continued

Year	Cow Budget <sup>b/</sup>	Replacement Budget <sup>b/</sup>	Cull Cow Budget <sup>c/</sup>	Steef Calf Budget <sup>c/</sup>	Heifer Calf Budget <sup>c/</sup>
1968	-159.11	-148.69	365.67	272.96	223.21
1969	-159.31	-146.55	389.83	304.50	253.16
1970	-157.89	-150.25	392.27	302.09	261.26
1971	-145.99	-135.08	406.28	294.74	253.67
1972	-151.70	-153.73	457.08	369.47	309.19
1973	-174.20	-190.87	512.41	392.47	330.02
1974	-202.78	-218.32	267.62	176.39	143.36
1975	-190.69	-191.96	264.84	170.64	137.73
1976	-237.26	-195.54	259.56	170.36	138.14
1977	-171.61	-152.61	265.59	197.76	163.92
1978	-160.35	-145.93	406.90	301.62	254.20

a/ Detailed budgets can be found in Appendix F.

b/ Cash costs, 1978 dollars.

c/ Returns over cash costs. For the steer and heifer calf sale there are no expenses deducted.

Table 17. Linear Programming Budgets<sup>a/</sup> (1973 Dollars)

Year	Wintering Steer Budget <sup>b/</sup>	Wintering Heifer Budget <sup>b/</sup>	Combination July Sale Budget <sup>c/</sup>	Combination Oct. Sale Budget <sup>d/</sup>
1949	\$392.19	\$316.73	\$372.69	\$427.95
1950	423.58	352.18	458.62	559.60
1951	528.85	427.16	568.76	649.38
1952	498.19	361.63	460.33	457.99
1953	271.91	198.57	270.24	293.25
1954	301.05	175.25	279.56	339.76
1955	281.02	200.19	291.19	325.03
1956	248.23	187.16	251.09	322.30
1957	301.16	267.48	324.14	384.47
1958	405.73	319.42	405.76	461.58
1959	412.24	374.79	419.01	419.54
1960	369.20	325.80	351.06	364.37
1961	320.98	284.33	301.58	380.30
1962	340.22	299.36	342.91	410.34
1963	313.87	208.20	331.63	358.27
1964	230.94	185.81	248.10	276.92
1965	267.64	205.70	290.33	342.80
1966	318.16	263.19	320.07	349.68
1967	294.72	246.65	312.94	336.55
1968	301.22	274.77	317.85	342.04
1969	366.95	295.51	373.49	368.81
1970	356.42	295.92	363.64	356.69
1971	347.29	274.81	350.31	383.48
1972	358.77	292.49	386.59	453.60
1973	418.34	338.35	459.33	491.82
1974	228.00	163.39	191.09	228.03
1975	167.05	117.79	160.96	227.36
1976	172.75	133.49	154.98	162.52
1977	203.65	159.16	205.25	219.54
1978	312.38	266.01	315.68	371.82
1979	404.14	343.14	381.79	402.24

a/ The returns over cash costs are computed from October 15 until the date of sale. No charge is deducted for beginning value of the animal.

b/ At a rate of gain of 1.5 lb./day.

c/ The rates of gain assumed are 1.0 and 1.4 lb./day for the wintering and summering periods, respectively.

d/ The rates of gain assumed are 1.0 and 1.2 lb./day for the wintering and summering periods, respectively.

## CHAPTER V

### THE LINEAR PROGRAMMING MODEL--RESULTS AND DISCUSSION

The levels at which the alternatives were selected in the optimal plan are shown in Table 18. Alternatives are arranged with each year's herd and the marketing decisions for the animals produced in that year all on one line. For example, on the 1948-49 line the cow, steer calf, heifer calf and cull cow alternatives are for 1948; and the replacement heifer, wintering and summering alternatives are for 1949. The summering alternatives shown in the table are for a combination wintering-summering program.

Table 19 shows the marginal costs on the optimal objective value for forcing one unit of a slack variable (one which was not selected in the optimal plan) into solution. Table 19 displays the alternative in the same manner used in Table 18.

The optimal plan, solved assuming perfect foresight, supports, clarifies and quantifies the general conclusions reached from the simple model. Given a fixed pasture resource, the optimal solution indicates the most profitable allocation of this resource among different beef production alternatives--a parameter which, with the simple model, was difficult to quantify.

As suggested by the simple budgets, the optimal plan selected a counter-cyclical cow herd size during all three cycles shown. The size of the herd was reduced in the fall of 1951, 1961 and 1973 to 75%, 30% and 64%, respectively, of levels of the previous year. The levels of reduction were greatest in the 1950s and 1970s when the price breaks were the greatest. Following the decrease in size, the herd was gradually rebuilt, reaching its maximum size in four to five years. The herd size then remained stable until the next price break. Had the model allowed purchase of replacements, more dramatic changes likely would have been seen.

The reduction in herd size in 1951 came two years prior to the bust year. The strategy suggested earlier recommended heavy culling one year before the negative price break. From 1951 to 1953 returns declined from an excellent level to losses or near losses. The optimal plan took advantage of the excellent prices in 1951 and culled a large number of the cows before the moderate price decline in 1952.

Cow numbers in the model were reduced again in 1961, two years before the bust year. This reduction occurred because of the high returns to the summering steers in 1962. It was more profitable to reduce the cow herd to provide pasture resources for summering the year prior to the bust year. Slight reductions in herd size occurred again in 1963 and 1966 to accommodate summering steers on the limited pasture resource. (It should be noted that we do not know of any predictive model that can forecast years of excellent summering returns.)

A sharp break in prices occurred in 1974. The size of the cow herd was reduced one year before this large price break, as was suggested earlier after the simple analysis. Because prices increased the two years prior to the bust year and summering returns were not high enough to compete with cows for pasture, the herd was not reduced earlier as it was in the 1950s and 1960s. This is the recommended strategy, since price bust years are somewhat predictable (11).

Because of the requirements of the model, replacements were selected in all but the last two years. In 1978 and 1979 there was no incentive to replace the herd because of the herd liquidation in 1978. The only consistent difference in the number of heifers retained as replacements was in the year prior to and the year during which large herd reductions occurred. The number of replacements retained in those years was approximately half the normal amount. At those times it was more profitable to market the heifers while prices were high.

Cull cows were not marketed every year. From 1952 through 1957 there were no cows culled. Realistically, that would not be the case, but 75% of the herd was culled in 1951 and the normal assumption would be that the producer would keep the youngest and most productive stock. Therefore, during the expansion of the herd, culling would be at a minimum. There is a similar but shorter period in the plan that occurred in the 1970s.

Table 18. Alternatives Selected In The Final Solution<sup>a/</sup>

	-----no. of head-----							
	Cow	Steer Calf	Heifer Calf	Cull Cow	Replacement Heifer	Winter Heifer	Winter Steer	Summer-Oct Steer
1948-49 <sup>b/</sup>	77.00	--	--	15.47	10.37	21.98	18.40	13.94
1949-50	59.98	--	--	--	11.20	13.98	25.24	--
1950-51	69.16	--	--	4.28	3.29	25.79	29.10	--
1951-52	74.69	--	27.90	54.56	3.79	--	31.43	--
1952-53	21.93	9.32	--	--	9.18	--	--	--
1953-54	25.29	--	--	--	10.59	--	--	10.59
1954-55	33.96	--	--	--	14.22	--	--	14.22
1955-56	43.87	--	--	--	9.89	8.52	--	18.37
1956-57	57.21	--	--	--	10.45	13.71	18.92	5.31
1957-58	65.96	--	--	5.42	10.46	17.25	27.76	--
1958-59	69.68	--	--	9.04	10.42	18.85	29.32	--
1959-60	69.71	--	--	9.27	10.76	18.52	29.33	--
1960-61	69.47	--	--	7.09	7.50	21.69	29.23	--
1961-62	71.75	--	--	27.81	8.51	21.64	--	30.04
1962-63	50.01	--	13.16	0.76	7.97	--	--	20.94
1963-64	56.76	24.12	14.79	10.45	9.19	--	--	--
1964-65	53.15	--	--	--	10.60	11.72	10.45	11.86
1965-66	61.28	--	--	--	9.06	16.68	25.79	--
1966-67	70.65	--	--	17.86	10.45	19.23	16.46	13.21
1967-68	60.43	--	--	--	10.45	14.93	25.43	--
1968-69	69.68	--	--	9.05	10.45	18.82	29.32	--
1969-70	69.68	--	--	9.06	10.46	18.81	29.32	--
1970-71	69.68	--	--	9.01	10.39	18.88	29.32	--
1971-72	69.73	--	--	9.51	11.13	18.15	29.34	--
1972-73	69.21	--	--	4.73	3.97	25.13	29.12	--
1973-74	74.22	31.54	26.90	50.23	4.58	--	--	--
1974-75	26.48	--	--	--	11.09	--	--	11.09
1975-76	30.53	--	--	--	12.78	--	12.85	--
1976-77	41.00	--	--	--	17.17	--	--	17.17
1977-78	52.96	--	--	--	--	22.29	10.91	11.32
1978-79	69.07	--	--	67.69	--	29.07	29.07	--

a/ The summering budget with sale of the steer in July was included as an alternative, but it was not selected in any of the years.

b/ The disposition alternatives for a calf produced in year n are all listed on one line. For example, in the first line the cow, steer calf, heifer calf and cull cow alternatives occur in 1948; and the replacement heifer, wintering and summering alternatives occur in 1949.

Table 19. The Marginal Cost Of Forcing One Unit Of A Slack Alternative <sup>a/</sup> (1978 Dollars)

	<u>Steer Calf</u>	<u>Heifer Calf</u>	<u>Cull Cow</u>	<u>Replacement Heifer</u>	<u>Winter Heifer</u>	<u>Winter Steer</u>	<u>Summer-Oct Steer</u>	<u>Summer-July Steer</u>
1948-49	\$69.90	\$25.43	\$ --	\$ --	\$ --	\$ --	\$ --	\$54.10
1949-50	113.39	76.53	2.67	--	--	--	98.45	198.18
1950-51	126.24	62.02	--	--	--	--	28.66	107.71
1951-52	24.93	--	--	--	46.21	--	42.67	38.85
1952-53	--	17.25	167.46	--	94.82	44.80	25.02	47.09
1953-54	104.93	49.77	205.45	--	60.71	37.04	--	59.20
1954-55	97.54	21.86	158.88	--	2.12	42.41	--	32.88
1955-56	30.93	4.16	105.38	--	--	19.18	--	70.42
1956-57	70.77	84.06	108.46	--	--	--	--	59.43
1957-58	118.05	77.45	--	--	--	--	120.25	174.86
1958-59	41.27	56.33	--	--	--	--	1.69	0.99
1959-60	25.12	36.11	--	--	--	--	22.72	34.93
1960-61	26.09	37.62	--	--	--	--	17.77	95.53
1961-62	53.63	38.08	--	--	--	17.54	--	66.37
1962-63	10.48	--	--	--	72.95	16.86	--	25.66
1963-64	--	--	--	--	70.58	68.64	24.14	52.07
1964-65	29.17	1.32	49.36	--	--	--	--	51.68
1965-66	60.14	50.99	56.60	--	--	--	5.61	34.28
1966-67	15.42	3.58	--	--	--	--	--	22.73
1967-68	29.81	45.25	15.53	--	--	--	26.35	49.64
1968-69	90.36	69.37	--	--	--	--	78.93	73.17
1969-70	48.39	39.83	--	--	--	--	56.50	48.49
1970-71	41.76	10.83	--	--	--	--	47.70	79.84
1971-72	60.48	35.92	--	--	--	--	43.65	109.60
1972-73	44.73	25.81	--	--	--	--	39.78	71.03
1973-74	--	--	--	--	169.93	168.39	170.33	206.09
1974-75	47.61	169.41	249.23	--	198.11	59.19	--	65.73
1975-76	0.40	194.22	244.58	--	201.78	--	11.09	18.11
1976-77	45.90	174.68	272.91	--	156.79	14.77	--	13.64
1977-78	111.53	99.46	204.56	471.15	--	--	--	55.21
1978-79	98.52	85.54	--	--	--	--	3.90	23.15

<sup>a/</sup> The cow alternative was not included because there were no years in which it was slack.

The optimal solution showed that wintering heifers was profitable during the transition and expansion phase of all three cycles. In the 1950s and 1970s, during the bust year and liquidation phase, there were five consecutive years in which heifers were not marketed. In 1951 and 1973 the heifers were sold as calves in the fall to take advantage of the excellent prices prior to the break year. The entire heifer production of the next three years was withheld from the market as replacement heifers. A portion of the heifer calves produced in 1956 and 1977 were wintered and sold in the spring of the next year, leaving almost five full years between marketings of heifers. The optimal plan in doing this circumvented potential losses in the bust year and the following liquidation phase. It should be noted, however, that the LP model did not include tax considerations that might make it more prudent to at least partially avoid the sharp changes in beef sales observed in this plan.

The pattern in the 1960s was different from that of the other two cycles. Because the price levels did not decrease as dramatically, cow numbers remained higher, so more heifer calves were produced. With higher cow numbers, a lower proportion of the heifers was needed as replacement stock for expansion of the herd. Heifers were sold as calves in 1962 before the decrease in returns in 1963, and again in 1963 to avoid wintering losses. Prices rebounded faster in the 1960s and heifers produced in 1964 were wintered and sold in the spring of 1965. There were only two years between heifer marketings in the 1960s.

With steers it was possible to skip a year of marketing with the summering alternative (making two full years between marketing dates). Steers were sold as calves in 1952, 1963 and 1973 prior to the bust years. In all three cycles the steer calves produced in the bust years (1953, 1964 and 1974) were wintered and summered and then marketed in the fall, a full year later. The optimal plan was therefore able to avoid the very large losses incurred by selling any steers in the bust years.

Future use of the term summering will indicate a combination wintering/summering program.

In all the years except 1952, 1963 and 1973 (preceding the bust years), the steers produced were either wintered or summered. Thus, the only time that feeders should be sold as calves--the typical production/marketing plan followed by most northern Minnesota feeder producers--is the year prior to the bust year. Wintering was quite consistently favored during the expansion phase of the cattle cycle. Selection of the October-sale summering alternative was more sporadic but appeared to be favored most frequently during the liquidation phase that follows the bust years. The July-sale summering alternative was not selected in any of the years.

The pasture availability was divided into two periods in the model. Pasture resources were limiting in the period from May 15 through July 15 but not from July 16 through October 15. Based on returns to the limited pasture resource, the October sale was selected above the July sale in all years in which summering was selected. With a higher proportion of first to second period pasture resources, which could occur in a drought year, the July sale would likely be a more favorable alternative.

Following the bust year in the 1950s, steers were summered in the next three years, and a portion of the steers were summered in the fourth year. When cow numbers were expanding and excess pasture was available, the summering alternative was always selected. Also, returns to summering rebounded quickly following the price bust, making it the most profitable alternative. When the cow herd expanded to the point where the two alternatives (cow or steer summering) were in competition for pasture, the pasture resource was most profitably allocated to the cow herd. (This refinement of the optimum production/marketing strategy was not obvious from the single budgets developed in Chapter II.)

The 1970s demonstrated a similar pattern except that steers were wintered in 1976. The marginal cost of summering in that year was \$11.09.

The pattern of steer alternatives selected in the 1960s was more sporadic. As was explained earlier, returns to summering were excellent prior to the price break year and cow numbers were affected. Summering was a less viable alternative during the liquidation phase of the cycle because the cow herd was larger compared to the 1950s and 1970s.

The objective value of the optimal solution can be considered the returns to land, facilities, labor and management. The total return over cash costs for 31 years, including the sale of the cow herd, was \$226,427. That translates into an average yearly return of \$7,304.10. A cow-calf operation with a stable number of cows (69 head) selling calves in the fall had a return of \$117,989 for 31 years--an average of \$55 per cow. The perfect strategy increased returns 92% above the returns to an

operation that did not vary its production marketing plan from the typical fall sale of feeder calves. The improvement would be even greater if compared to the "typical" producer, who increases and decreases cow numbers in accordance with the cycle and, consequently, has the maximum number of calves to sell in the low price years.

Returns to an operation with stable cow numbers that wintered steers and heifers every year were \$156,923. With pasture resources held constant, returns to a stable operation also summering steers had a return of \$151,636. Returns to consistent use of summering and wintering alone also did not attain the level of returns gained from the optimal solution. The perfect strategy increased returns 31% and 33% above the returns to wintering and combination wintering-summering, respectively.

During three cattle cycles the optimal plan showed several recurring patterns which, if anticipated, have the potential to increase returns to a feeder cattle production enterprise. Granted, it is impossible to predict a perfect production/marketing strategy given an unknown future. But the optimal plan gives an indication of some general strategies which, if implemented, would provide returns significantly greater than those achieved by the average cow-calf producer. It must be reemphasized that flexibility is essential to any strategy that incorporates changes in production patterns.

The primary objective of a marketing strategy is to increase profits or decrease losses. As was shown in Tables 8 through 12, losses can be substantial. A marketing strategy should prevent or reduce large losses and place the producer in a position to take advantage of profitable situations. With a marketing strategy that depends on production alternatives it is necessary for the producer to be informed about the cattle cycle, which phase it is in, and be able to anticipate when a significant negative break in prices is going to occur.

Based on 31 years of returns, the LP computer model suggests the same two general production/marketing strategies that were suggested by the simpler budgeting procedure: varying the herd size in a counter-cyclical manner, and varying the production alternatives depending on the phase of the cycle.

When a negative price break is imminent and prices are still good, the cow herd should be reduced approximately 50% from maximum capacity. If this is done a year earlier than it should be, there will be some income loss, but excess pasture can be either rented out or used to graze purchased feeders that are forward-priced on the futures market to ensure normal returns. The average reduction for the three cycles was 56% when the herd was at or near maximum capacity. This places a producer in the position to minimize losses and frees pasture resources for summering steers after the price break occurs. As noted above, extra pasture resources can be either rented out or used to pasture purchased feeders for a couple years until the cow/long yearling program requires all the pasture. Following the price break year, the herd should be expanded to full capacity during the liquidation phase of the cattle cycle. To accomplish the expansion, a large proportion of the heifers produced will have to be retained as replacement stock. Therefore, only a small proportion of the heifers produced during the liquidation phase should be marketed.

The feeder animals produced the year prior to the bust year should be marketed as calves. If the calves are wintered the year of the bust, large losses will occur, and carrying them through the summer offers little chance to recoup those losses. However, the steers produced in the bust year should be summered. This strategy resulted in the best returns in all three cycles. Summering of the steers should be continued until the cow herd is expanded to the point where the cows require all of the pasture. Following expansion of the cow herd to capacity, the steers and heifers should be wintered and sold in May until the next price break appears to be imminent (during the transition and expansion phases of the cattle cycle).

This general production/marketing strategy should not be construed as a complete and rigid plan. It is a long-range framework upon which to build annual and shorter term marketing decisions. For example, the addition of a forward pricing strategy, although not analyzed in this study, would help to prevent losses during the mid-decade years when the price bust is expected (11). Also, it should be noted that the general plan did not consider variation in the carrying capacity of the pasture. A drought, for instance, could make summering infeasible and necessitate changing rations to substitute more grains for high cost hay and poor productivity pasture.



Again, this production/marketing framework requires producer flexibility and awareness for it to work. The phase of the cattle cycle, the management ability of the producer, and the risk attitude of the producer and his creditor are all important factors to consider before applying the results of this study to a particular farm situation. But the authors do strongly encourage all feeder producers to use the strategies suggested here. Application of these strategies has the potential to increase beef enterprise earnings 25% to 100% during the next cattle cycle--depending on which production/marketing strategies are currently in use.

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APPENDIX A - SOURCES OF DATA

Choice October Feeder Calf Prices And Utility Cow Prices - South St. Paul

<u>Year</u>	<u>425 Pound Steer Calf Oct. Average</u>	<u>400 Pound Heifer Calf Oct. Average</u>	<u>Utility<sup>a/</sup> Cow Oct. Average</u>	<u>Utility<sup>a/</sup> Cow Yearly Average</u>
1947 <sup>b/</sup>		\$18.86		
1948	\$26.00	25.00	\$18.32	\$19.64
1949	24.00	22.68	14.73	16.41
1950	32.02	30.90	20.40	19.36
1951	41.26	37.80	23.75	23.95
1952	28.30	26.20	15.48	19.06
1953	20.00	17.00	10.56	12.51
1954	19.38	16.50	9.92	11.16
1955 <sup>c/</sup>	20.35	16.75	10.66	11.33
1956	20.05	16.96	10.27	11.13
1957	25.60	22.90	13.34	13.26
1958	33.90	30.90	17.64	17.83
1959	31.82	28.45	15.09	17.30
1960	27.58	24.50	13.90	19.33
1961	28.42	25.95	14.75	15.40
1962	30.65	28.60	14.98	15.31
1963	29.00	26.37	14.36	14.75
1964	23.31	21.25	12.45	13.46
1965	25.74	22.49	14.39	14.43
1966	29.10	26.92	17.34	18.03
1967	28.84	25.89	16.84	17.72
1968	30.50	26.50	17.84	18.59
1969	35.66	31.50	19.90	20.77
1970	37.00	34.00	20.94	22.09
1971	38.00	34.75	22.81	22.55
1972	49.62	44.12	26.66	26.49
1973	60.72	54.25	34.35	34.46
1974	31.08	26.84	20.79	27.27
1975	33.00	28.30	22.59	22.15
1976	34.96	30.12	23.51	26.78
1977	42.92	37.80	25.42	26.95
1978	70.97	63.55	41.69	38.23

a/ The medium grade (all weights) was used for 1948 through 1950. The utility grade was introduced in 1951.

b/ U.S. Department of Agriculture, Agricultural Marketing Service, Detailed Livestock Quotations, (South St. Paul, monthly, 1948-1954)

c/ U.S. Department of Agriculture, Agricultural Marketing Service, Detailed Livestock Quotations, (South St. Paul, annual, 1955-1979)

October Choice Heifers - South St. Paul

<u>Year</u>	<u>Average Of Weight Range (Lb.)</u>	<u>Dollars Per Cwt.</u>	<u>Average Of Weight Range (Lb.)</u>	<u>Dollars Per Cwt.</u>
1948	700	35.15	900	35.40
1949 a/	700	30.11	900	30.11
1950	700	30.49	900	30.49
1951	700	35.41	900	35.75
1952	700	31.52	900	31.64
1953	700	22.32	900	22.82
1954	700	22.75	900	22.90
1955 b/	700	21.15	900	21.31
1956	700	22.65	900	22.86
1957	700	21.91	900	22.27
1958	700	25.65	900	25.83
1959	700	25.00	900	25.10
1960	800	23.11	1000	23.12
1961	800	22.95	1000	22.95
1962	800	26.92	1000	27.15
1963	800	23.07	1000	23.07
1964	800	22.60	1000	22.76
1965	800	23.33	1000	23.67
1966	800	23.91	1000	24.05
1967	800	25.02	1000	25.02
1968	800	25.38	1000	25.54
1969	800	26.46	1000	26.58
1970	800	27.22	1000	27.26
1971	800	30.55	1000	30.83
1972	800	33.62	1000	33.62
1973	800	39.75	1000	39.68
1974	800	37.81	1000	38.10
1975	800	44.25	1000	45.25
1976	800	35.42	1000	35.84
1977	800	38.93	1000	39.45
1978	800	51.93	1000	52.07

- a/ U.S. Department of Agriculture, Agricultural Marketing Service,  
Detailed Livestock Quotations, (South St. Paul, monthly, 1948-1954)
- b/ U.S. Department of Agriculture, Agricultural Marketing Service,  
Detailed Livestock Quotations, (South St. Paul, annual, 1955-1979)

May Choice Steers - South St. Paul  
Dollars Per Hundredweight For The Average Weight Of Several Weight Ranges

<u>Year</u>	<u>Lb.</u>	<u>\$/Cwt.</u>	<u>Lb.</u>	<u>\$/Cwt.</u>	<u>Lb.</u>	<u>\$/Cwt.</u>	<u>Lb.</u>	<u>\$/Cwt.</u>
1949 <sup>a/</sup>	400	26.50	650	25.58	925	24.56		
1950	400	28.78	650	28.08	925	27.00		
1951	400	36.16	650	34.91	925	33.86		
1952	400	35.50	650	34.25	925	33.25		
1953	400	22.50	650	21.50	925	20.00		
1954	400	19.50	650	21.72	925	22.22		
1955 <sup>b/</sup>	400	21.60	650	21.50	925	21.18		
1956	400	20.00	650	19.90	925	18.30		
1957	425	22.08	650	22.55	925	20.00		
1958	400	30.50	650	29.50	925	25.75		
1959	400	34.50	650	31.00	925	27.00		
1960	425	29.00	650	28.00	900	25.07		
1961	400	26.02	650	25.25	925	23.14		
1962	425	28.50	650	27.00	900	24.25		
1963	425	28.75	650	22.75	900	22.75		
1964	425	24.65	650	22.22	900	19.15		
1965	425	24.31	650	23.61	900	22.38		
1966	425	29.50	650	27.50	875	26.25		
1967	425	28.70	650	26.55	875	24.80		
1968	425	30.15	650	27.74	875	26.30		
1969	425	35.75	650	33.98	875	31.36		
1970	425	38.64	650	35.39	875	31.39		
1971	425	37.00	650	35.00	875	32.25		
1972	450	43.45	550	39.95	650	38.17	750	37.26
1973	450	58.50	550	56.00	650	54.34	750	51.03
1974	450	45.94	550	44.44	650	42.27	750	41.19
1975	450	33.25	550	33.50	650	34.19	750	35.12
1976	450	41.50	550	41.17	650	41.00	750	40.15
1977	450	43.65	550	42.90	650	42.15	750	41.10
1978	450	61.21	550	60.15	650	59.47	750	58.26
1979	450	95.62	550	88.16	650	82.90	750	80.07

a/ U.S. Department of Agriculture, Agricultural Marketing Service,  
Detailed Livestock Quotations, (South St. Paul, monthly, 1948-1954)

b/ U.S. Department of Agriculture, Agricultural Marketing Service,  
Detailed Livestock Quotations, (South St. Paul, annual, 1955-1979)

May Choice Heifers - South St. Paul  
Dollars Per Hundredweight For The Average Weight Of Several Weight Ranges

<u>Year</u>	<u>Lb.</u>	<u>\$/Cwt.</u>	<u>Lb.</u>	<u>\$/Cwt.</u>	<u>Lb.</u>	<u>\$/Cwt.</u>	<u>Lb.</u>	<u>\$/Cwt.</u>
1949 <sup>a/</sup>	400	25.00	625	23.15				
1950	400	26.78	625	25.77				
1951	400	34.14	625	31.58				
1952	400	35.50	625	30.00				
1953	400	19.50	625	18.50				
1954	400	19.50	625	17.44				
1955 <sup>b/</sup>	400	18.60	625	18.20				
1956	400	16.50	625	16.55				
1957	400	19.00	625	19.85				
1958	400	26.50	625	25.00				
1959	400	32.00	625	29.50				
1960	400	26.00	625	25.50				
1961	400	23.82	625	23.44				
1962	400	26.27	625	25.02				
1963	400	26.25	625	21.25				
1964	400	22.90	625	20.15				
1965	400	21.22	625	20.42				
1966	400	26.00	600	25.00				
1967	400	25.95	600	24.40				
1968	400	26.65	600	25.05				
1969	400	32.00	600	30.00				
1970	400	35.64	600	31.89	800	29.24		
1971	400	34.00	600	31.00				
1972	450	38.80	550	35.80	650	34.30		
1973	450	51.50	550	49.00	650	46.89	800	44.44
1974	450	39.96	550	38.08	650	36.72		
1975	450	27.50	550	28.50	650	29.50	750	30.88
1976	450	35.72	550	36.05	650	36.05	750	35.82
1977	450	37.52	550	36.60	650	36.35	750	36.35
1978	450	55.75	550	54.91	650	53.91	750	53.36
1979	450	83.30	550	79.70	650	74.60	750	71.74

a/ U.S. Department of Agriculture, Agricultural Marketing Service,  
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b/ U.S. Department of Agriculture, Agricultural Marketing Service,  
Detailed Livestock Quotations, (South St. Paul, annual, 1955-1979)

July Choice Feeder Steers - South St. Paul  
Dollars Per Hundredweight For The Average Weight Of Two Weight Ranges

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<u>Year</u>	<u>Lb.</u>	<u>\$/Cwt.</u>	<u>Lb.</u>	<u>\$/Cwt.</u>
1949 a/	650	23.50	925	23.00
1950	650	28.50	925	28.00
1951	650	36.00	925	35.00
1952	650	31.22	925	30.42
1953	650	19.81	925	19.57
1954	650	20.08	925	20.58
1955 b/	650	20.94	925	20.62
1956	650	18.75	925	18.25
1957	650	22.94	925	21.10
1958	650	28.50	925	25.75
1959	650	30.51	925	27.43
1960	650	26.00	925	24.40
1961	650	23.58	925	21.10
1962	650	26.35	900	23.76
1963	650	25.94	900	23.17
1964	650	22.17	900	19.83
1965	650	24.25	900	23.25
1966	650	26.96	875	25.50
1967	650	27.12	875	25.56
1968	650	28.50	875	26.50
1969	650	33.76	875	31.58
1970	650	35.15	875	31.25
1971	650	34.75	875	32.00
1972	650	40.15	750	38.23
1973	650	55.45	750	52.73
1974	650	36.08	750	35.11
1975	650	32.34	750	33.84
1976	650	38.30	750	37.00
1977	650	41.00	750	40.50
1978	650	60.74	750	57.19
1979	650	79.95	750	75.70

a/ U.S. Department of Agriculture, Agricultural Marketing Service,  
Detailed Livestock Quotations, (South St. Paul, monthly, 1948-1954)

b/ U.S. Department of Agriculture, Agricultural Marketing Service,  
Detailed Livestock Quotations, (South St. Paul, annual, 1955-1979)

October Choice Feeder Steers - South St. Paul  
Dollars Per Hundredweight For The Average Weight Of Two Weight Ranges

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<u>Year</u>	<u>Lb.</u>	<u>\$/Cwt.</u>	<u>Lb.</u>	<u>\$/Cwt.</u>
1949 a/	650	23.82	925	23.00
1950	650	30.21	925	29.49
1951	650	37.06	925	35.06
1952	650	28.29	925	27.51
1953	650	19.52	925	18.50
1954	650	21.00	925	21.00
1955 b/	650	20.50	925	20.25
1956	650	20.07	925	20.07
1957	650	23.86	925	22.68
1958	650	30.20	925	26.26
1959	650	28.18	925	25.92
1960	650	24.70	925	23.22
1961	650	26.45	925	23.50
1962	650	28.33	900	25.66
1963	650	25.74	900	23.24
1964	650	21.81	900	20.50
1965	650	24.76	900	24.25
1966	650	27.02	875	25.10
1967	650	26.70	875	24.98
1968	650	28.50	875	26.00
1969	650	31.50	875	29.00
1970	650	33.19	875	29.38
1971	650	34.75	875	32.25
1972	750	40.47	900	38.83
1973	750	52.25	900	49.53
1974	750	36.19	900	35.19
1975	750	37.00	900	37.50
1976	750	35.12	900	34.45
1977	750	39.18	900	37.82
1978	750	62.05	900	57.19
1979	750	75.04	900	70.57

a/ U.S. Department of Agriculture, Agricultural Marketing Service,  
Detailed Livestock Quotations, (South St. Paul, monthly, 1948-1954)

b/ U.S. Department of Agriculture, Agricultural Marketing Service,  
Detailed Livestock Quotations, (South St. Paul, annual, 1955-1979)



Price Adjustment Index And Interest Rates

Year	Prices Paid By <sup>a/</sup> Farmers Index Annual, 1967 = 100	Production Credit Association's Average Cost of Loans <sup>b/</sup> Annual Percent
1948	76	5.56
1949	73	5.96
1950	75	6.01
1951	82	6.08
1952	84	6.33
1953	81	6.35
1954	81	6.36
1955	81	5.92
1956	81	6.20
1957	84	6.66
1958	86	6.72
1959	87	6.50
1960	88	7.25
1961	88	6.61
1962	90	6.36
1963	91	6.30
1964	92	6.47
1965	94	6.58
1966	98	6.87
1967	100	7.29
1968	104	7.34
1969	109	7.79
1970	114	8.98
1971 <sup>c/</sup>	120	7.28
1972	125	7.02
1973	144	8.09
1974	164	9.43
1975	180	8.91
1976	191	8.24
1977 <sup>d/</sup>	202	7.88
1978 <sup>e/</sup>	219	8.83
1979	250 <sup>f/</sup>	10.57 <sup>g/</sup>

a/ The "Price Paid By Farmers Index" includes commodities, interest, taxes and wage rates.

b/ The rate represents interest (less patronage dividends), service fees, cost of record searches, and filing and releasing mortgages, etc., paid by borrowers as a percent of average loans outstanding during the year.

c/ U.S. Department of Agriculture, Agricultural Statistics, 1972, pp. 502, 587.

d/ U.S. Department of Agriculture, Agricultural Statistics, 1978, pp. 416, 484.

e/ U.S. Department of Agriculture, Agricultural Statistics, 1979, pp. 454, 483.

f/ U.S. Department of Agriculture, Agricultural Outlook, AO-51, January-February 1980, p. 19.

g/ Interview with Harlan Stoehr, Production Credit Association, St. Paul Minnesota, February 1981.

Corn And Hay Prices <sup>a/</sup> (Prices Received By Farmers)

<u>Year</u>	<u>Seasonal Average Price, All Hay, Baled (\$/T) <sup>b/</sup></u>	<u>Seasonal Average Price Corn (\$/Bu.)</u>
1948	17.34	1.21
1949	15.64	1.19
1950	16.07	1.43
1951	12.92	1.40
1952	13.86	1.40
1953	12.92	1.45
1954	13.77	1.34
1955	14.11	1.37
1956	14.03	1.22
1957	12.50	.91
1958	12.92	1.01
1959	17.00	.96
1960	14.37	.91
1961	15.30	1.03
1962	14.71	1.05
1963	14.71	1.03
1964	19.38	1.09
1965	17.85	1.06
1966	16.15	1.16
1967	17.43	.98
1968	17.43	1.02
1969	17.43	1.05
1970	16.58	1.18
1971	17.00	1.01
1972	18.28	1.50
1973	23.80	2.48
1974	38.25	2.92
1975	42.08	2.50
1976	59.93	2.03
1977	40.80	1.90
1978	34.84	2.08
1979	33.58	2.00

a/ Minnesota Department Of Agriculture, State Crop And Livestock Reporting Service, Minnesota Agricultural Statistics, 1958, p. 65; 1968, p. 76; 1972, p. 76; 1978, pp. 69-71; 1980, pp. 80-81.

b/ The price of all hay in Minnesota Agricultural Statistics was multiplied by a factor of .85 to arrive at the prices listed in the table.

Feed Requirements For A Single Cow And Replacement By Period

	<u>Corn (Bu.)</u>	<u>Alfalfa-Bromegrass Hay (T.)</u>
<u>Cow</u>		
October 16 - November 26	--	.412
November 27 - February 28	--	1.114
March 1 - May 15	--	1.039
Total	0.0	2.57
<u>Replacement</u>		
Wintering, October 16 - May 15	20.21	1.30
October 16 - November 26 <sup>a/</sup>	1.9	.14
November 27 - February 28 <sup>a/</sup>	--	.06
Total	22.11	1.50

a/ Additional above cow requirement after heifer enters herd.

APPENDIX B - COW-CALF BUDGETS

Cow And Calf Prices In 1978 Dollars

<u>Year</u>	<u>Heifer Price</u>	<u>Steer Price</u>	<u>October Cow Price</u>	<u>Average Cow Price</u>
1948	\$72.04	\$74.92	\$52.79	\$56.59
1949	68.04	72.00	44.19	49.23
1950	90.23	93.50	59.57	56.53
1951	100.95	110.19	63.43	63.96
1952	68.31	73.78	40.36	49.69
1953	45.96	54.07	28.55	33.82
1954	44.61	52.40	26.82	30.17
1955	45.29	55.02	28.82	30.63
1956	45.85	54.21	27.77	30.09
1957	59.70	66.74	34.78	34.57
1958	78.69	86.33	44.92	45.40
1959	71.62	80.10	37.99	43.55
1960	60.97	68.64	34.59	48.11
1961	64.58	70.73	36.71	38.32
1962	69.59	74.58	36.45	37.25
1963	63.46	69.79	34.56	35.50
1964	50.58	55.49	29.64	32.04
1965	52.40	59.97	33.53	33.62
1966	60.16	65.03	38.75	40.29
1967	56.70	63.16	36.88	38.81
1968	55.80	64.23	37.57	39.15
1969	63.29	71.65	39.98	41.73
1970	65.32	71.08	40.23	42.44
1971	63.42	69.35	41.63	41.15
1972	77.30	86.93	46.71	46.41
1973	82.51	92.34	52.24	52.41
1974	35.84	41.50	27.76	36.42
1975	34.43	40.15	27.48	26.95
1976	34.54	40.09	26.96	30.71
1977	40.98	46.53	27.56	29.22
1978	63.55	70.97	41.69	38.23

Actual Feed Prices, Feed Costs And Feed Costs In 1978 Dollars

<u>Year</u>	<u>Hay Price Per Ton</u>	<u>Corn Price Per Bushel</u>	<u>Feed Cost</u>	<u>Feed Cost</u>
1948	\$17.34	\$1.21	\$52.40	\$150.98
1949	15.64	1.19	47.59	142.76
1950	16.07	1.43	49.58	144.78
1951	12.92	1.40	40.69	108.68
1952	13.86	1.40	43.32	112.93
1953	12.92	1.45	40.86	110.48
1954	13.77	1.34	42.87	115.90
1955	14.11	1.37	43.92	118.73
1956	14.03	1.22	43.19	116.78
1957	12.50	.91	37.90	98.80
1958	12.92	1.01	39.40	100.33
1959	17.00	.96	50.62	127.42
1960	14.37	.91	43.11	107.29
1961	15.30	1.03	46.11	114.74
1962	14.71	1.05	44.53	108.35
1963	14.71	1.03	44.46	107.00
1964	19.38	1.09	57.69	137.32
1965	17.85	1.06	53.32	124.23
1966	16.15	1.16	48.91	109.30
1967	17.43	.98	51.88	113.62
1968	17.43	1.02	52.02	109.53
1969	17.43	1.05	52.12	104.71
1970	16.58	1.18	50.18	96.39
1971	17.00	1.01	50.78	92.68
1972	18.28	1.50	55.98	98.08
1973	23.80	2.48	74.64	113.51
1974	38.25	2.92	116.41	155.45
1975	42.08	2.50	125.70	152.94
1976	59.93	2.03	173.94	199.44
1977	40.80	1.90	120.14	130.25
1978	34.84	2.08	104.11	104.11

Interest On The Value Of The Cow

<u>Year</u>	<u>Interest Rate</u>	<u>Cow Price</u>	<u>Cow Value</u>	<u>Interest Charge</u>	<u>Interest Charge a/</u>
1948	5.56 %	\$19.64	\$196.40	\$10.92	\$31.47
1949	5.96	16.41	164.10	9.78	29.34
1950	6.01	19.36	193.60	11.64	33.98
1951	6.08	23.95	239.50	14.56	38.89
1952	6.33	19.06	190.60	12.06	31.46
1953	6.35	12.51	125.10	7.94	21.48
1954	6.36	11.16	111.60	7.10	19.19
1955	5.92	11.33	113.30	6.71	18.13
1956	6.20	11.13	111.30	6.90	18.66
1957	6.66	13.26	132.60	8.83	23.02
1958	6.72	17.83	178.30	11.98	30.51
1959	6.50	17.30	173.00	11.24	28.31
1960	7.25	19.33	193.30	14.01	34.88
1961	6.61	15.40	154.00	10.18	25.33
1962	6.36	15.31	153.10	9.74	23.69
1963	6.30	14.75	147.50	9.29	22.36
1964	6.47	13.46	134.60	8.71	20.73
1965	6.58	14.43	144.30	9.49	22.12
1966	6.87	18.03	180.30	12.39	27.68
1967	7.29	17.72	177.20	12.92	28.29
1968	7.34	18.59	185.90	13.65	28.73
1969	7.79	20.77	207.70	16.18	32.51
1970	8.98	22.09	220.90	19.84	38.11
1971	7.28	22.55	225.50	16.42	29.96
1972	7.02	26.49	264.90	18.60	32.58
1973	8.09	34.46	344.60	27.88	42.40
1974	9.43	27.27	272.70	25.72	34.34
1975	8.91	22.15	221.50	19.74	24.01
1976	8.24	26.78	267.80	22.07	25.30
1977	7.88	26.95	269.50	21.24	23.02
1978	8.83	38.23	382.30	33.76	33.76

a/ in 1978 dollars

Interest On The Replacement Heifers & Total Interest Charge

<u>Year</u>	<u>871 Lb. Replacement Heifer Price</u>	<u>Replacement Heifer Average Value</u>	<u>Interest Charge</u>	<u>Interest Charge<sup>a/</sup></u>	<u>Total Interest Cow &amp; Replacement<sup>a/</sup></u>
1948	\$35.36	\$191.73	\$1.60	\$4.61	\$36.07
1949	30.11	181.13	1.62	4.86	34.20
1950	30.49	178.14	1.61	4.69	38.66
1951	35.70	217.28	1.98	5.29	44.18
1952	31.62	213.32	2.03	5.28	36.74
1953	22.75	151.47	1.44	3.90	25.38
1954	22.88	133.63	1.27	3.45	22.64
1955	21.29	125.70	1.12	3.02	21.15
1956	22.83	132.92	1.24	3.34	22.00
1957	22.22	130.68	1.31	3.40	26.43
1958	25.80	158.18	1.59	4.06	34.57
1959	25.09	171.05	1.67	4.20	32.50
1960	23.11	157.56	1.71	4.26	39.14
1961	22.95	148.95	1.48	3.68	29.01
1962	27.00	169.49	1.62	3.93	27.63
1963	23.07	157.67	1.49	3.59	25.95
1964	22.66	151.41	1.47	3.50	24.23
1965	23.45	144.63	1.43	3.33	25.45
1966	23.96	149.32	1.54	3.44	31.12
1967	25.02	162.80	1.78	3.90	32.19
1968	25.44	162.56	1.79	3.77	32.50
1969	26.50	168.42	1.97	3.95	36.46
1970	27.23	181.60	2.45	4.70	42.81
1971	30.65	201.48	2.20	4.02	33.98
1972	33.62	215.92	2.27	3.98	36.56
1973	39.73	261.24	3.17	4.82	47.22
1974	37.91	273.61	3.87	5.17	39.51
1975	44.60	247.93	3.31	4.03	28.04
1976	35.57	211.50	2.61	3.00	28.30
1977	39.11	230.58	2.73	2.95	25.98
1978	51.98	301.97	4.00	4.00	37.76

a/ in 1978 dollars

Returns Over Cash Costs For An 85 Percent Calf Crop In 1978 Dollars

<u>Year</u>	<u>Returns From Calves</u>	<u>Cull Cow Sales</u>	<u>Interest Cost</u>	<u>Feed Cost</u>	<u>Other Cash Costs</u>	<u>Returns Over Cash Costs</u>
1948	\$210.25	\$68.63	\$36.07	\$150.98	\$35.00	\$56.82
1949	200.81	57.45	34.20	142.76	35.00	46.30
1950	262.72	77.44	38.66	144.78	35.00	121.71
1951	304.03	82.46	44.18	108.68	35.00	198.62
1952	204.31	52.47	36.74	112.93	35.00	72.10
1953	145.47	37.12	25.38	110.48	35.00	11.74
1954	141.04	34.87	22.64	115.90	35.00	2.37
1955	146.48	37.47	21.15	118.73	35.00	9.06
1956	145.60	36.10	22.00	116.78	35.00	7.92
1957	182.65	45.21	26.43	98.80	35.00	67.63
1958	237.76	58.40	34.57	100.33	35.00	126.25
1959	219.16	49.38	32.50	127.42	35.00	73.62
1960	187.39	44.97	39.14	107.29	35.00	50.92
1961	194.91	47.72	29.01	114.74	35.00	63.88
1962	207.09	47.39	27.63	108.35	35.00	83.50
1963	192.06	44.93	25.95	107.00	35.00	69.04
1964	152.83	38.53	24.23	137.32	35.00	-5.19
1965	162.81	43.58	25.45	124.23	35.00	21.72
1966	180.02	50.37	31.12	109.30	35.00	54.98
1967	173.05	47.94	32.19	113.62	35.00	40.18
1968	174.04	48.84	32.50	109.53	35.00	45.84
1969	195.23	51.98	36.46	104.71	35.00	71.04
1970	196.31	52.29	42.81	96.39	35.00	74.41
1971	191.22	54.12	33.98	92.68	35.00	83.68
1972	237.42	60.72	36.56	98.08	35.00	128.49
1973	252.60	67.91	47.22	113.51	35.00	124.79
1974	112.24	36.09	39.51	155.45	35.00	-81.63
1975	108.33	35.73	28.04	152.94	35.00	-71.92
1976	108.32	35.04	28.30	199.44	35.00	-119.38
1977	126.67	35.83	25.98	130.25	35.00	-28.73
1978	194.28	54.20	37.76	104.11	35.00	71.61

Returns Over Cash Costs For A 95 Percent Calf Crop In 1978 Dollars

<u>Year</u>	<u>Returns From Calves</u>	<u>Cull Cow Sales</u>	<u>Interest Cost</u>	<u>Feed Cost</u>	<u>Other Cash Costs</u>	<u>Returns Over Cash Costs</u>
1948	\$240.58	\$68.63	\$36.07	\$150.98	\$35.00	\$87.15
1949	229.72	57.45	34.20	142.76	35.00	75.21
1950	300.63	77.44	38.66	144.78	35.00	159.62
1951	347.64	82.46	44.18	108.68	35.00	242.23
1952	233.65	52.47	36.74	112.93	35.00	101.44
1953	166.16	37.12	25.38	110.48	35.00	32.42
1954	161.10	34.87	22.64	115.90	35.00	22.43
1955	167.23	37.47	21.15	118.73	35.00	29.81
1956	166.29	36.10	22.00	116.78	35.00	28.61
1957	208.77	45.21	26.43	98.80	35.00	93.75
1958	271.84	58.40	34.57	100.33	35.00	160.34
1959	250.50	49.38	32.50	127.42	35.00	104.96
1960	214.16	44.97	39.14	107.29	35.00	77.70
1961	222.86	47.72	29.01	114.74	35.00	91.83
1962	236.86	47.39	27.63	108.35	35.00	113.27
1963	219.58	44.93	25.95	107.00	35.00	96.56
1964	174.74	38.53	24.23	137.32	35.00	16.71
1965	186.03	43.58	25.45	124.23	35.00	44.94
1966	205.87	50.37	31.12	109.30	35.00	80.83
1967	197.81	47.94	32.19	113.62	35.00	64.94
1968	198.85	48.84	32.50	109.53	35.00	70.65
1969	223.12	51.98	36.46	104.71	35.00	98.92
1970	224.48	52.29	42.81	96.39	35.00	102.58
1971	218.64	54.12	33.98	92.68	35.00	111.10
1972	271.35	60.72	36.56	98.08	35.00	162.43
1973	288.73	67.91	47.22	113.51	35.00	160.91
1974	128.23	36.09	39.51	155.45	35.00	-65.64
1975	123.75	35.73	28.04	152.94	35.00	-56.50
1976	123.75	35.04	28.30	199.44	35.00	-103.95
1977	144.75	35.83	25.98	130.25	35.00	-10.65
1978	222.07	54.20	37.76	104.11	35.00	99.40



Returns Over Cash Costs For A 75 Percent Calf Crop In 1978 Dollars

<u>Year</u>	<u>Returns From Calves</u>	<u>Cull Cow Sales</u>	<u>Interest Cost</u>	<u>Feed Cost</u>	<u>Other Cash Costs</u>	<u>Returns Over Cash Costs</u>
1948	\$179.92	\$68.63	\$36.07	\$150.98	\$35.00	\$26.49
1949	171.90	57.45	34.20	142.76	35.00	17.39
1950	224.80	77.44	38.66	144.78	35.00	83.80
1951	260.42	82.46	44.18	108.68	35.00	155.01
1952	174.97	52.47	36.74	112.93	35.00	42.76
1953	124.79	37.12	25.38	110.48	35.00	-8.95
1954	120.98	34.87	22.64	115.90	35.00	-17.69
1955	125.73	37.47	21.15	118.73	35.00	-11.69
1956	124.91	36.10	22.00	116.78	35.00	-12.77
1957	156.52	45.21	26.43	98.80	35.00	41.51
1958	203.68	58.40	34.57	100.33	35.00	92.17
1959	187.81	49.38	32.50	127.42	35.00	42.27
1960	160.61	44.97	39.14	107.29	35.00	24.14
1961	166.97	47.72	29.01	114.74	35.00	35.94
1962	177.32	47.39	27.63	108.35	35.00	53.73
1963	164.54	44.93	25.95	107.00	35.00	41.52
1964	130.92	38.53	24.23	137.32	35.00	-27.10
1965	139.59	43.58	25.45	124.23	35.00	-1.50
1966	154.17	50.37	31.12	109.30	35.00	29.13
1967	148.29	47.94	32.19	113.62	35.00	15.42
1968	149.23	48.84	32.50	109.53	35.00	21.04
1969	167.35	51.98	36.46	104.71	35.00	43.16
1970	168.15	52.29	42.81	96.39	35.00	46.24
1971	163.80	54.12	33.98	92.68	35.00	56.26
1972	203.48	60.72	36.56	98.08	35.00	94.56
1973	216.48	67.91	47.22	113.51	35.00	88.66
1974	96.25	36.09	39.51	155.45	35.00	-97.62
1975	92.91	35.73	28.04	152.94	35.00	-87.34
1976	92.90	35.04	28.30	199.44	35.00	-134.80
1977	108.58	35.83	25.98	130.25	35.00	-46.82
1978	166.49	54.20	37.76	104.11	35.00	43.82

APPENDIX C - STEERS-WINTERING BUDGETS

Steer Calf Prices And Adjusted May Prices In 1978 Dollars

<u>Year</u>	<u>Index</u>	<u>Oct Price</u>	<u>May Price</u>		
		<u>425 lb.</u>	<u>531 lb.</u>	<u>637 lb.</u>	<u>743 lb.</u>
1949	73	\$74.92	\$79.61	\$76.88	\$73.61
1950	75	72.00	84.63	82.10	79.31
1951	82	93.50	96.72	93.41	90.44
1952	84	110.19	92.66	89.46	86.64
1953	81	73.78	60.60	58.27	55.62
1954	81	54.07	55.87	58.41	59.18
1955	81	52.40	59.42	58.14	56.68
1956	81	55.02	55.01	53.82	51.29
1957	84	54.21	58.14	58.72	55.41
1958	86	66.74	77.86	75.25	70.45
1959	87	86.33	83.87	78.49	73.14
1960	88	80.10	72.42	69.83	65.63
1961	88	68.64	65.03	62.94	59.84
1962	90	70.73	68.98	65.91	61.95
1963	91	74.58	67.10	62.39	58.10
1964	92	69.79	57.07	53.23	49.17
1965	94	55.49	56.99	55.10	52.86
1966	98	59.97	65.09	61.71	59.09
1967	100	65.03	61.85	58.42	55.43
1968	104	63.16	62.32	58.71	56.02
1969	109	64.23	71.56	68.25	64.77
1970	114	71.65	72.71	68.35	63.51
1971	120	71.08	67.12	64.09	60.56
1972	125	69.35	72.58	67.28	64.08
1973	144	86.93	87.61	82.97	76.40
1974	164	92.34	60.92	56.82	54.00
1975	180	41.50	40.70	41.49	42.65
1976	191	40.15	48.22	47.04	45.18
1977	202	40.09	47.60	45.80	43.75
1978	219	46.53	61.56	59.56	57.18
1979	250	70.97	80.04	73.22	68.91

Steer - Winter Gross Margin And Death Loss Cost In 1978 Dollars

<u>Year</u>	<u>Gross Margin</u>			<u>Death Loss Cost</u>		
	<u>0.5 lb/day</u>	<u>1.0 lb/day</u>	<u>1.5 lb/day</u>	<u>0.5 lb/day</u>	<u>1.0 lb/day</u>	<u>1.5 lb/day</u>
1949	\$104.34	\$171.33	\$228.49	\$3.71	\$4.04	\$4.33
1950	143.36	216.98	283.26	3.78	4.14	4.48
1951	116.22	197.65	274.61	4.55	4.96	5.35
1952	23.71	101.56	175.44	4.80	5.19	5.56
1953	8.24	57.61	99.70	3.18	3.42	3.63
1954	66.84	142.27	209.90	2.63	3.01	3.35
1955	92.85	147.68	198.44	2.69	2.97	3.22
1956	58.27	108.98	147.28	2.63	2.88	3.07
1957	78.35	143.66	181.32	2.70	3.02	3.21
1958	129.78	195.71	239.82	3.49	3.82	4.04
1959	78.48	133.11	176.52	4.06	4.33	4.55
1960	44.12	104.37	147.21	3.62	3.93	4.14
1961	53.58	109.21	152.91	3.18	3.46	3.68
1962	65.71	119.26	159.67	3.33	3.60	3.80
1963	39.35	80.43	114.70	3.37	3.57	3.74
1964	6.44	42.45	68.73	3.00	3.18	3.31
1965	66.77	115.17	156.94	2.69	2.93	3.14
1966	90.78	138.24	184.20	3.00	3.24	3.47
1967	52.03	95.74	135.46	3.02	3.24	3.44
1968	62.49	105.54	147.78	3.00	3.21	3.42
1969	107.00	161.76	208.31	3.26	3.54	3.77
1970	81.61	130.87	167.41	3.45	3.70	3.88
1971	54.33	106.14	147.91	3.29	3.55	3.76
1972	90.67	133.83	181.40	3.40	3.62	3.85
1973	95.72	159.05	198.19	4.17	4.49	4.69
1974	-68.99	-30.51	8.77	3.58	3.77	3.97
1975	39.73	87.89	140.50	1.96	2.20	2.47
1976	85.43	128.98	165.06	2.13	2.35	2.53
1977	82.39	121.40	154.67	2.12	2.31	2.48
1978	129.11	181.63	227.07	2.62	2.89	3.11
1979	123.39	164.79	210.37	3.63	3.84	4.07

Steer - Winter Feed And Interest Expenses In 1978 Dollars

<u>Year</u>	<u>Feed Cost</u>			<u>Interest Charge</u>		
	<u>0.5 lb/day</u>	<u>1.0 lb/day</u>	<u>1.5 lb/day</u>	<u>0.5 lb/day</u>	<u>1.0 lb/day</u>	<u>1.5 lb/day</u>
1949	\$79.78	\$102.40	\$130.24	\$12.83	\$13.99	\$14.98
1950	80.59	107.28	140.56	13.18	14.47	15.63
1951	60.14	84.27	114.74	16.08	17.52	18.88
1952	62.63	86.11	115.64	17.65	19.09	20.44
1953	61.07	86.40	118.46	11.72	12.63	13.40
1954	64.35	87.62	116.80	9.72	11.12	12.37
1955	65.93	89.71	119.54	9.25	10.20	11.07
1956	65.05	86.11	112.31	9.47	10.38	11.07
1957	55.27	70.26	88.64	10.43	11.69	12.42
1958	56.04	72.36	92.49	13.60	14.89	15.75
1959	71.66	86.64	104.49	15.33	16.36	17.18
1960	60.21	74.38	91.49	15.26	16.53	17.43
1961	64.31	80.41	100.01	12.23	13.30	14.13
1962	60.64	76.76	96.49	12.32	13.31	14.05
1963	59.91	75.53	94.61	12.32	13.07	13.70
1964	77.24	93.32	112.46	11.27	11.94	12.44
1965	69.80	85.17	103.61	10.29	11.21	12.01
1966	61.17	77.53	97.56	11.98	12.93	13.84
1967	63.91	77.21	93.04	12.80	13.73	14.57
1968	61.56	74.92	90.90	12.78	13.69	14.59
1969	58.82	71.96	87.76	14.77	16.01	17.06
1970	53.95	68.25	85.74	18.01	19.29	20.25
1971	52.07	63.55	77.31	13.92	15.02	15.90
1972	54.71	71.44	92.15	13.87	14.75	15.72
1973	62.89	87.19	117.80	19.61	21.10	22.02
1974	86.87	111.58	142.00	19.61	20.66	21.74
1975	85.93	104.87	127.57	10.16	11.40	12.76
1976	113.02	126.62	141.34	10.21	11.25	12.12
1977	73.49	86.03	100.55	9.68	10.58	11.34
1978	58.49	71.44	86.99	13.45	14.80	15.97
1979	49.38	60.29	73.37	22.30	23.58	24.98

APPENDIX D - HEIFERS-WINTERING BUDGETS

Heifer Calf Prices And Adjusted May Prices In 1978 Dollars

Year	Index	Oct Price	May Price		
		400 lb.	506 lb.	612 lb.	718 lb.
1949	73	\$72.04	\$73.83	\$69.77	\$65.81
1950	75	68.04	78.34	75.42	72.55
1951	82	90.23	89.72	84.74	79.89
1952	84	100.95	87.51	79.04	70.84
1953	81	68.31	52.48	50.17	47.92
1954	81	45.96	51.10	47.47	43.95
1955	81	44.61	50.77	49.27	47.79
1956	81	45.29	44.67	44.74	44.80
1957	84	45.85	50.58	51.62	52.67
1958	86	59.70	67.00	63.88	60.84
1959	87	78.69	79.14	74.62	70.22
1960	88	71.62	65.40	63.53	61.69
1961	88	60.97	60.01	58.39	56.77
1962	90	64.58	63.74	61.06	58.43
1963	91	69.59	58.65	51.84	45.24
1964	92	63.46	52.46	48.34	44.35
1965	94	50.58	49.53	47.68	45.87
1966	98	52.40	58.06	55.73	53.46
1967	100	60.16	56.13	53.23	50.40
1968	104	56.70	55.42	52.55	54.11
1969	109	55.80	63.41	60.03	56.75
1970	114	63.29	65.94	60.83	57.09
1971	120	65.32	60.33	56.25	52.28
1972	125	63.42	66.33	61.09	57.14
1973	144	77.30	77.72	72.53	68.23
1974	164	82.51	52.99	49.72	46.84
1975	180	35.84	34.14	35.43	37.03
1976	191	34.43	41.17	41.33	40.33
1977	202	34.54	40.92	39.51	38.62
1978	219	40.98	56.39	54.29	52.47
1979	250	63.55	72.63	67.05	62.37

Heifer - Winter Gross Margin And Death Loss Cost In 1978 Dollars

<u>Year</u>	<u>Gross Margin</u>			<u>Death Loss Cost</u>		
	<u>0.5 lb/day</u>	<u>1.0 lb/day</u>	<u>1.5 lb/day</u>	<u>0.5 lb/day</u>	<u>1.0 lb/day</u>	<u>1.5 lb/day</u>
1949	\$85.44	\$138.84	\$184.38	\$3.31	\$3.58	\$3.80
1950	124.26	189.40	248.74	3.34	3.67	3.97
1951	93.06	157.68	212.67	4.07	4.40	4.67
1952	39.01	79.93	104.83	4.23	4.44	4.56
1953	-7.69	33.84	70.86	2.69	2.90	3.09
1954	74.72	106.69	131.73	2.21	2.37	2.50
1955	78.48	123.09	164.65	2.18	2.40	2.61
1956	44.91	92.65	140.53	2.04	2.27	2.51
1957	72.51	132.52	194.74	2.20	2.50	2.81
1958	100.19	152.15	198.03	2.89	3.15	3.38
1959	85.69	141.94	189.46	3.58	3.86	4.09
1960	44.47	102.35	156.45	3.09	3.38	3.65
1961	59.77	113.45	163.75	2.74	3.01	3.26
1962	64.21	115.35	161.22	2.90	3.16	3.39
1963	18.42	38.86	46.47	2.88	2.98	3.02
1964	11.58	42.02	64.62	2.60	2.75	2.86
1965	48.29	89.48	126.99	2.26	2.47	2.66
1966	84.18	131.50	174.24	2.52	2.75	2.97
1967	43.40	85.15	121.27	2.62	2.83	3.01
1968	53.63	94.79	161.71	2.54	2.74	3.08
1969	97.63	144.20	184.23	2.72	2.95	3.15
1970	80.51	119.12	156.78	2.93	3.13	3.32
1971	44.01	82.97	114.09	2.83	3.03	3.18
1972	81.98	120.21	156.59	2.95	3.14	3.32
1973	84.06	134.70	180.70	3.51	3.77	4.00
1974	-61.87	-25.71	6.32	2.99	3.17	3.33
1975	29.38	73.46	122.53	1.58	1.80	2.05
1976	70.59	115.24	151.86	1.73	1.95	2.14
1977	68.92	103.67	139.16	1.73	1.90	2.08
1978	121.38	168.33	212.78	2.25	2.48	2.70
1979	113.30	156.13	193.64	3.11	3.32	3.51

Heifer - Winter Feed And Interest Expenses In 1978 Dollars

<u>Year</u>	<u>Feed Cost</u>			<u>Interest Charge</u>		
	<u>0.5 lb/day</u>	<u>1.0 lb/day</u>	<u>1.5 lb/day</u>	<u>0.5 lb/day</u>	<u>1.0 lb/day</u>	<u>1.5 lb/day</u>
1949	\$76.31	\$101.94	\$133.14	\$11.45	\$12.38	\$13.17
1950	77.24	107.78	145.38	11.67	12.81	13.84
1951	57.82	85.69	120.42	14.39	15.53	16.50
1952	60.15	87.18	120.73	15.56	16.32	16.77
1953	58.75	88.05	124.63	9.94	10.70	11.38
1954	61.76	88.50	121.61	8.17	8.76	9.22
1955	63.27	90.60	124.45	7.48	8.25	8.97
1956	62.33	86.38	115.97	7.33	8.19	9.05
1957	52.84	69.77	90.31	8.50	9.66	10.86
1958	53.62	72.14	94.75	11.28	12.29	13.19
1959	68.31	84.89	104.46	13.50	14.56	15.46
1960	57.47	73.30	92.25	13.00	14.22	15.36
1961	61.42	79.51	101.30	10.51	11.54	12.51
1962	57.96	76.15	98.16	10.73	11.67	12.52
1963	57.25	74.85	96.11	10.52	10.90	11.04
1964	73.63	91.42	112.41	9.76	10.33	10.75
1965	66.57	83.66	103.97	8.66	9.44	10.16
1966	58.46	76.93	99.30	10.04	10.99	11.84
1967	60.92	75.63	92.99	11.11	11.99	12.76
1968	58.71	73.54	91.12	10.81	11.69	13.12
1969	56.11	70.74	88.16	12.31	13.36	14.27
1970	51.56	67.69	87.21	15.30	16.31	17.29
1971	49.67	62.42	77.58	11.98	12.80	13.46
1972	52.38	71.42	94.74	12.01	12.79	13.54
1973	60.43	88.44	123.27	16.50	17.69	18.77
1974	83.09	111.10	145.20	16.38	17.37	18.25
1975	81.96	103.01	128.02	8.18	9.32	10.59
1976	107.32	121.36	136.37	8.28	9.35	10.23
1977	69.94	83.53	99.13	7.90	8.70	9.51
1978	55.79	70.20	87.32	11.52	12.72	13.86
1979	47.10	59.23	73.65	19.08	20.40	21.55

APPENDIX E - STEERS-SUMMERING BUDGETS

Steers - July And Adjusted May Prices In 1978 Dollars

Year	Index	May Price		July Price	
		531 lb.	637 lb.	628 lb.	722 lb.
1949	73	\$79.61	\$76.88	\$70.62	\$70.11
1950	75	84.63	82.10	83.33	82.84
1951	82	96.72	93.41	96.35	95.44
1952	84	92.66	89.46	81.56	80.85
1953	81	60.60	58.27	53.61	53.39
1954	81	55.87	58.41	54.19	54.65
1955	81	59.42	58.14	56.68	56.39
1956	81	55.01	53.82	50.80	50.34
1957	84	58.14	58.72	60.18	58.54
1958	86	77.86	75.25	73.12	70.73
1959	87	83.87	78.49	77.40	74.76
1960	88	72.42	69.83	65.01	63.66
1961	88	65.03	62.94	59.16	57.06
1962	90	68.98	65.91	64.66	62.29
1963	91	67.10	62.39	63.00	60.50
1964	92	57.07	53.23	53.25	51.16
1965	94	56.99	55.10	56.70	55.82
1966	98	65.09	61.71	60.56	59.20
1967	100	61.85	58.42	59.72	58.29
1968	104	62.32	58.71	60.41	58.66
1969	109	71.56	68.25	68.25	66.42
1970	114	72.71	68.35	68.24	65.11
1971	120	67.12	64.09	63.90	61.80
1972	125	72.58	67.28	71.06	67.91
1973	144	87.61	82.97	85.22	81.34
1974	164	60.92	56.82	48.46	47.24
1975	180	40.70	41.49	38.96	40.67
1976	191	48.22	47.04	44.23	42.84
1977	202	47.60	45.80	44.57	44.06
1978	219	61.56	59.56	61.50	58.17
1979	250	80.04	73.22	70.83	67.34



Steers - Summer-July Sale - Gross Margin, Death Loss Cost And Interest Charge In 1978 Dollars

Year	Gross Margin		Death Loss Cost		Interest Rate	Interest Charge	
	1.6 lb/day	1.4 lb/day	1.6 lb/day	1.4 lb/day		1.6 lb/day	1.4 lb/day
1949	\$21.14	\$16.69	\$.87	\$1.00	5.96%	\$4.32	\$4.96
1950	74.47	75.43	.97	1.12	6.01	4.89	5.63
1951	92.09	94.47	1.12	1.28	6.08	5.69	6.53
1952	20.63	14.14	1.00	1.15	6.33	5.31	6.10
1953	15.19	14.50	.66	.76	6.35	3.50	4.02
1954	43.95	22.68	.64	.77	6.36	3.39	4.08
1955	40.77	36.97	.67	.78	5.92	3.32	3.85
1956	27.22	20.83	.61	.71	6.20	3.17	3.66
1957	69.56	48.88	.69	.80	6.66	3.82	4.44
1958	46.19	31.60	.87	.99	6.72	4.90	5.56
1959	41.20	40.07	.93	1.04	6.50	5.06	5.65
1960	24.14	15.06	.79	.90	7.25	4.81	5.48
1961	26.61	11.27	.72	.81	6.61	3.96	4.49
1962	40.14	30.15	.77	.87	6.36	4.11	4.62
1963	39.68	39.62	.75	.83	6.30	3.96	4.39
1964	31.69	30.53	.64	.71	6.47	3.45	3.83
1965	53.80	52.27	.66	.75	6.58	3.62	4.15
1966	35.01	34.54	.73	.82	6.87	4.17	4.71
1967	46.98	49.00	.70	.79	7.29	4.29	4.83
1968	48.85	49.79	.71	.80	7.34	4.36	4.89
1969	49.04	45.10	.81	.91	7.79	5.27	5.95
1970	42.83	35.02	.82	.91	8.98	6.12	6.80
1971	45.24	38.24	.76	.85	7.28	4.61	5.20
1972	61.30	61.99	.83	.92	7.02	4.88	5.39
1973	70.47	59.05	1.00	1.12	8.09	6.77	7.54
1974	-18.88	-20.68	.63	.70	9.43	4.95	5.54
1975	28.76	29.50	.46	.56	8.91	3.43	4.16
1976	21.99	9.83	.53	.61	8.24	3.68	4.19
1977	27.40	26.51	.53	.61	7.88	3.51	4.02
1978	59.71	40.83	.71	.80	8.83	5.26	5.90
1979	20.25	20.06	.87	.95	10.57	7.69	8.42

Steers - October And Adjusted May Prices In 1978 Dollars

<u>Year</u>	<u>Index</u>	<u>May Price</u>		<u>October Price</u>	
		<u>531 lb.</u>	<u>637 lb.</u>	<u>745 lb.</u>	<u>820 lb.</u>
1949	73	\$79.61	\$76.88	\$70.61	\$69.93
1950	75	84.63	82.10	87.49	86.91
1951	82	96.72	93.41	97.13	95.66
1952	84	92.66	89.46	73.05	72.49
1953	81	60.60	58.27	51.82	51.07
1954	81	55.87	58.41	56.78	56.78
1955	81	59.42	58.14	55.19	55.01
1956	81	55.01	53.82	54.26	54.26
1957	84	58.14	58.72	61.14	60.30
1958	86	77.86	75.25	73.43	70.68
1959	87	83.87	78.49	68.97	67.41
1960	88	72.42	69.83	60.19	59.18
1961	88	65.03	62.94	63.28	61.27
1962	90	68.98	65.91	66.46	64.50
1963	91	67.10	62.39	59.65	57.84
1964	92	57.07	53.23	50.73	49.79
1965	94	56.99	55.10	57.23	56.87
1966	98	65.09	61.71	58.57	57.13
1967	100	61.85	58.42	56.88	55.62
1968	104	62.32	58.71	57.79	56.02
1969	109	71.56	68.25	61.16	59.48
1970	114	72.71	68.35	60.66	58.21
1971	120	67.12	64.09	61.49	59.96
1972	125	72.58	67.28	71.00	69.55
1973	144	87.61	82.97	79.60	77.52
1974	164	60.92	56.82	48.37	47.70
1975	180	40.70	41.49	45.00	45.30
1976	191	48.22	47.04	40.29	39.91
1977	202	47.60	45.80	42.52	41.78
1978	219	61.56	59.56	62.21	59.76
1979	250	80.04	73.22	65.86	63.89

Steers - Summer-October Sale - Gross Margin, Death Loss Cost And Interest Charge In 1978 Dollars

Year	Gross Margin		Death Loss Cost		Interest Rate	Interest Charge	
	1.4 lb/day	1.2 lb/day	1.4 lb/day	1.2 lb/day		1.4 lb/day	1.2 lb/day
1949	\$103.42	\$84.13	\$2.37	\$2.66	5.96%	\$11.85	\$13.29
1950	202.58	190.20	2.75	3.09	6.01	13.87	15.57
1951	210.21	190.00	3.09	3.45	6.08	15.77	17.59
1952	52.34	25.00	2.59	2.91	6.33	13.75	15.45
1953	64.36	47.86	1.77	1.98	6.35	9.42	10.52
1954	126.45	93.83	1.80	2.10	6.36	9.59	11.17
1955	95.75	81.01	1.82	2.05	5.92	9.02	10.20
1956	112.26	102.47	1.74	1.97	6.20	9.05	10.24
1957	146.89	120.76	1.91	2.17	6.66	10.67	12.13
1958	133.77	100.63	2.40	2.65	6.72	13.53	14.92
1959	68.57	53.14	2.40	2.63	6.50	13.07	14.35
1960	64.03	40.88	2.08	2.33	7.25	12.66	14.14
1961	126.30	101.87	2.04	2.26	6.61	11.32	12.52
1962	128.98	109.46	2.15	2.37	6.36	11.48	12.65
1963	88.22	77.23	2.00	2.18	6.30	10.57	11.51
1964	74.99	69.51	1.70	1.87	6.47	9.24	10.14
1965	123.90	115.72	1.82	2.04	6.58	10.05	11.28
1966	90.78	75.69	1.96	2.15	6.87	11.26	12.41
1967	95.45	84.28	1.88	2.07	7.29	11.49	12.66
1968	99.71	85.76	1.90	2.08	7.34	11.72	12.83
1969	75.83	53.38	2.09	2.31	7.79	13.65	15.07
1970	65.95	42.30	2.10	2.28	8.98	15.78	17.18
1971	101.80	83.80	2.04	2.25	7.28	12.43	13.74
1972	143.65	142.17	2.29	2.50	7.02	13.45	14.70
1973	127.96	107.58	2.65	2.91	8.09	17.94	19.75
1974	36.97	29.45	1.71	1.88	9.43	13.52	14.89
1975	119.20	107.47	1.38	1.59	8.91	10.30	11.88
1976	44.20	27.86	1.39	1.57	8.24	9.61	10.83
1977	64.15	51.11	1.42	1.59	7.88	9.41	10.48
1978	136.68	111.02	1.98	2.17	8.83	14.63	16.10
1979	65.78	57.89	2.29	2.48	10.57	20.29	21.95

APPENDIX F - DETAILED LINEAR PROGRAM BUDGETS a/

Annual Cow Budgets

<u>Year</u>	<u>Index</u>	<u>Interest</u>	<u>Feed Cost</u>	<u>Other Cash Cost</u>	<u>Total Budget</u>
1948	76	\$-37.76	\$-128.41	\$-30.30	\$-196.47
1949	73	-35.21	-120.58	-30.30	-186.09
1950	75	-40.77	-120.60	-30.30	-191.67
1951	82	-46.67	-88.68	-30.30	-165.65
1952	84	-37.75	-92.87	-30.30	-160.91
1953	81	-25.77	-89.77	-30.30	-145.85
1954	81	-23.03	-95.68	-30.30	-149.01
1955	81	-21.76	-98.04	-30.30	-150.11
1956	81	-22.39	-97.49	-30.30	-150.18
1957	84	-27.63	-83.75	-30.30	-141.68
1958	86	-36.61	-84.56	-30.30	-151.47
1959	87	-33.97	-109.98	-30.30	-174.25
1960	88	-41.85	-91.91	-30.30	-164.06
1961	88	-30.40	-97.86	-30.30	-158.56
1962	90	-28.43	-91.99	-30.30	-150.72
1963	91	-26.84	-90.98	-30.30	-148.12
1964	92	-24.88	-118.56	-30.30	-173.74
1965	94	-26.55	-106.88	-30.30	-163.72
1966	98	-33.22	-92.75	-30.30	-156.27
1967	100	-33.95	-98.10	-30.30	-162.35
1968	104	-34.48	-94.33	-30.30	-159.11
1969	109	-39.01	-90.00	-30.30	-159.31
1970	114	-45.73	-81.86	-30.30	-157.89
1971	120	-35.95	-79.73	-30.30	-145.99
1972	125	-39.10	-82.31	-30.30	-151.70
1973	144	-50.88	-93.02	-30.30	-174.20
1974	164	-41.21	-131.27	-30.30	-202.78
1975	180	-28.81	-131.58	-30.30	-190.69
1976	191	-30.36	-176.60	-30.30	-237.26
1977	202	-27.63	-113.68	-30.30	-171.61
1978	219	-40.51	-89.54	-30.30	-160.35

a/ All receipts and expenses in Appendix F are in 1978 dollars except where noted.

Replacement Heifer Budgets

<u>Year</u>	<u>Index</u>	<u>Interest</u>	<u>Feed Cost</u>	<u>Other Cash Cost</u>	<u>Total Budget</u>
1949	73	\$-32.39	\$-149.35	\$-21.00	\$-202.73
1950	75	-31.26	-162.75	-21.00	-215.01
1951	82	-35.28	-134.47	-21.00	-190.75
1952	84	-35.20	-134.94	-21.00	-191.14
1953	81	-26.00	-139.12	-21.00	-186.12
1954	81	-22.98	-135.98	-21.00	-179.96
1955	81	-20.12	-139.16	-21.00	-180.28
1956	81	-22.28	-129.86	-21.00	-173.14
1957	84	-22.69	-101.36	-21.00	-145.05
1958	86	-27.07	-106.24	-21.00	-154.31
1959	87	-27.99	-117.64	-21.00	-166.63
1960	88	-28.43	-103.74	-21.00	-153.16
1961	88	-24.50	-113.81	-21.00	-159.32
1962	90	-26.23	-110.21	-21.00	-157.44
1963	91	-23.91	-107.93	-21.00	-152.84
1964	92	-23.32	-126.59	-21.00	-170.91
1965	94	-22.17	-117.01	-21.00	-160.18
1966	98	-22.92	-111.48	-21.00	-155.40
1967	100	-25.99	-104.73	-21.00	-151.72
1968	104	-25.13	-102.57	-21.00	-148.69
1969	109	-26.36	-99.19	-21.00	-146.55
1970	114	-31.33	-97.92	-21.00	-150.25
1971	120	-26.77	-87.31	-21.00	-135.08
1972	125	-26.56	-106.17	-21.00	-153.73
1973	144	-32.14	-137.72	-21.00	-190.87
1974	164	-34.45	-162.87	-21.00	-218.32
1975	180	-26.88	-144.08	-21.00	-191.96
1976	191	-19.98	-154.56	-21.00	-195.54
1977	202	-19.70	-111.92	-21.00	-152.61
1978	219	-26.66	-98.27	-21.00	-145.93

Budgets For Selling A Calf In The Fall

<u>Year</u>	<u>Index</u>	<u>Heifer Price</u>	<u>Heifer Budget</u>	<u>Steer Price</u>	<u>Steer Budget</u>
1948	76	\$72.04	\$288.16	\$74.92	\$318.41
1949	73	68.04	272.16	72.00	306.00
1950	75	90.23	360.91	93.50	397.37
1951	82	100.95	403.81	110.19	468.33
1952	84	68.31	273.23	73.78	313.57
1953	81	45.96	183.85	54.07	229.81
1954	81	44.61	178.44	52.40	222.69
1955	81	45.29	181.15	55.02	233.84
1956	81	45.85	183.42	54.21	230.39
1957	84	59.70	238.81	66.74	283.66
1958	86	78.69	314.75	86.33	366.89
1959	87	71.62	286.46	80.10	340.42
1960	88	60.97	243.89	68.64	291.71
1961	88	64.58	258.32	70.73	300.59
1962	90	69.59	278.37	74.58	316.97
1963	91	63.46	253.85	69.79	296.61
1964	92	50.58	202.34	55.49	235.82
1965	94	52.40	209.59	59.97	254.87
1966	98	60.16	240.63	65.03	276.38
1967	100	56.70	226.80	63.16	268.43
1968	104	55.80	223.21	64.23	272.96
1969	109	63.29	253.16	71.65	304.50
1970	114	65.32	261.26	71.08	302.09
1971	120	63.42	253.67	69.35	294.74
1972	125	77.30	309.19	86.93	369.47
1973	144	82.51	330.02	92.34	392.47
1974	164	35.84	143.36	41.50	176.39
1975	180	34.43	137.73	40.15	170.64
1976	191	34.54	138.14	40.09	170.36
1977	202	40.98	163.92	46.53	197.76
1978	219	63.55	254.20	70.97	301.62

Cull Cow Budgets

<u>Year</u>	<u>Index</u>	<u>October Cow Price a/</u>	<u>October Cow Price</u>	<u>Cow Value</u>	<u>Total Budget</u>
1948	76	\$18.32	\$52.79	\$527.91	\$517.91
1949	73	14.73	44.19	441.90	431.90
1950	75	20.40	59.57	595.68	585.68
1951	82	23.75	63.43	634.30	624.30
1952	84	15.48	40.36	403.59	393.59
1953	81	10.56	28.55	285.51	275.51
1954	81	9.92	26.82	268.21	258.21
1955	81	10.66	28.82	288.21	278.21
1956	81	10.27	27.77	277.67	267.67
1957	84	13.34	34.78	347.79	337.79
1958	86	17.64	44.92	449.20	439.20
1959	87	15.09	37.99	379.85	369.85
1960	88	13.90	34.59	345.92	335.92
1961	88	14.75	36.71	367.07	357.07
1962	90	14.98	36.45	364.51	354.51
1963	91	14.36	34.56	345.59	335.59
1964	92	12.45	29.64	296.36	286.36
1965	94	14.39	33.53	335.26	325.26
1966	98	17.34	38.75	387.50	377.50
1967	100	16.84	36.88	368.80	358.80
1968	104	17.84	37.57	375.67	365.67
1969	109	19.90	39.98	399.83	389.83
1970	114	20.94	40.23	402.27	392.27
1971	120	22.81	41.63	416.28	406.28
1972	125	26.66	46.71	467.08	457.08
1973	144	34.35	52.24	522.41	512.41
1974	164	20.79	27.76	277.62	267.62
1975	180	22.59	27.48	274.84	264.84
1976	191	23.51	26.96	269.56	259.56
1977	202	25.42	27.56	275.59	265.59
1978	219	41.69	41.69	416.90	406.90

a/ Actual cow prices.

Winter Heifer Budget - 1.5 Lb./Day Gain

<u>Year</u>	<u>Index</u>	<u>Interest</u>	<u>Feed Cost</u>	<u>Other Cash Costs</u>	<u>Heifer Value</u>	<u>Total Budget</u>
1949	73	\$-13.17	\$-133.14	\$-9.50	\$472.54	\$316.73
1950	75	-13.84	-145.38	-9.50	520.90	352.18
1951	82	-16.50	-120.42	-9.50	573.58	427.16
1952	84	-16.77	-120.73	-9.50	508.64	361.63
1953	81	-11.38	-124.63	-9.50	344.09	198.57
1954	81	-9.22	-121.61	-9.50	315.59	175.25
1955	81	-8.97	-124.45	-9.50	343.10	200.19
1956	81	-9.05	-115.97	-9.50	321.68	187.16
1957	84	-10.86	-90.31	-9.50	378.15	267.48
1958	86	-13.19	-94.75	-9.50	436.85	319.42
1959	87	-15.46	-104.46	-9.50	504.21	374.79
1960	88	-15.36	-92.25	-9.50	442.91	325.80
1961	88	-12.51	-101.30	-9.50	407.64	284.33
1962	90	-12.52	-98.16	-9.50	419.54	299.36
1963	91	-11.04	-96.11	-9.50	324.85	208.20
1964	92	-10.75	-112.41	-9.50	318.47	185.81
1965	94	-10.16	-103.97	-9.50	329.33	205.70
1966	98	-11.84	-99.30	-9.50	383.83	263.19
1967	100	-12.76	-92.99	-9.50	361.90	246.65
1968	104	-13.12	-91.12	-9.50	388.51	274.77
1969	109	-14.27	-88.16	-9.50	407.44	295.51
1970	114	-17.29	-87.21	-9.50	409.93	295.92
1971	120	-13.46	-77.58	-9.50	375.35	274.81
1972	125	-13.54	-94.74	-9.50	410.27	292.49
1973	144	-18.77	-123.27	-9.50	489.89	338.35
1974	164	-18.25	-145.20	-9.50	336.34	163.39
1975	180	-10.59	-128.02	-9.50	265.90	117.79
1976	191	-10.23	-136.37	-9.50	289.59	133.49
1977	202	-9.51	-99.13	-9.50	277.30	159.16
1978	219	-13.86	-87.32	-9.50	376.70	266.01
1979	250	-21.55	-73.65	-9.50	447.84	343.14



Winter Steer Budget - 1.5 Lb./Day Gain

<u>Year</u>	<u>Index</u>	<u>Interest</u>	<u>Feed Cost</u>	<u>Other Cash Costs</u>	<u>Steer Value</u>	<u>Total Budget</u>
1949	73	\$-14.98	\$-130.24	\$-9.50	\$546.90	\$392.19
1950	75	-15.63	-140.56	-9.50	589.26	423.58
1951	82	-18.88	-114.74	-9.50	671.98	528.85
1952	84	-20.44	-115.64	-9.50	643.77	498.19
1953	81	-13.40	-118.46	-9.50	413.28	271.91
1954	81	-12.37	-116.80	-9.50	439.72	301.05
1955	81	-11.07	-119.54	-9.50	421.13	281.02
1956	81	-11.07	-112.31	-9.50	381.11	248.23
1957	84	-12.42	-88.64	-9.50	411.71	301.16
1958	86	-15.75	-92.49	-9.50	523.48	405.73
1959	87	-17.18	-104.49	-9.50	543.41	412.24
1960	88	-17.43	-91.49	-9.50	487.63	369.20
1961	88	-14.13	-100.01	-9.50	444.62	320.98
1962	90	-14.05	-96.49	-9.50	460.26	340.22
1963	91	-13.70	-94.61	-9.50	431.67	313.87
1964	92	-12.44	-112.46	-9.50	365.34	230.94
1965	94	-12.01	-103.61	-9.50	392.76	267.64
1966	98	-13.84	-97.56	-9.50	439.06	318.16
1967	100	-14.57	-93.04	-9.50	411.84	294.72
1968	104	-14.59	-90.90	-9.50	416.21	301.22
1969	109	-17.06	-87.76	-9.50	481.27	366.95
1970	114	-20.25	-85.74	-9.50	471.91	356.42
1971	120	-15.90	-77.31	-9.50	449.99	347.29
1972	125	-15.72	-92.15	-9.50	476.14	358.77
1973	144	-22.02	-117.80	-9.50	567.66	418.34
1974	164	-21.74	-142.00	-9.50	401.24	228.00
1975	180	-12.76	-127.57	-9.50	316.89	167.05
1976	191	-12.12	-141.34	-9.50	335.70	172.75
1977	202	-11.34	-100.55	-9.50	325.03	203.65
1978	219	-15.97	-86.99	-9.50	424.83	312.38
1979	250	-24.98	-73.37	-9.50	511.99	404.14

Combination Winter-Summer Steer Budgets - July Sale<sup>a/</sup>

<u>Year</u>	<u>Index</u>	<u>Interest</u>	<u>Feed Cost</u>	<u>Other Cash Costs</u>	<u>Steer Value</u>	<u>Total Budget</u>
1949	73	\$-18.95	\$-102.40	\$-12.40	\$506.44	\$372.69
1950	75	-20.10	-107.28	-12.40	598.40	458.62
1951	82	-24.05	-84.27	-12.40	689.48	568.76
1952	84	-25.19	-86.11	-12.40	584.03	460.33
1953	81	-16.64	-86.40	-12.40	385.69	270.24
1954	81	-15.19	-87.62	-12.40	394.76	279.56
1955	81	-14.04	-89.71	-12.40	407.35	291.19
1956	81	-14.04	-86.11	-12.40	363.65	251.09
1957	84	-16.13	-70.26	-12.40	422.93	324.14
1958	86	-20.45	-72.36	-12.40	510.97	405.76
1959	87	-22.01	-86.64	-12.40	540.07	419.01
1960	88	-22.01	-74.38	-12.40	459.85	351.06
1961	88	-17.79	-80.41	-12.40	412.18	301.58
1962	90	-17.93	-76.76	-12.40	450.01	342.91
1963	91	-17.46	-75.53	-12.40	437.03	331.63
1964	92	-15.78	-93.32	-12.40	369.59	248.10
1965	94	-15.36	-85.17	-12.40	403.26	290.33
1966	98	-17.64	-77.53	-12.40	427.64	320.07
1967	100	-18.56	-77.21	-12.40	421.11	312.94
1968	104	-18.59	-74.92	-12.40	423.75	317.85
1969	109	-21.96	-71.96	-12.40	479.82	373.49
1970	114	-26.09	-68.25	-12.40	470.39	363.64
1971	120	-20.22	-63.55	-12.40	446.47	350.31
1972	125	-20.14	-71.44	-12.40	490.56	386.59
1973	144	-28.64	-87.19	-12.40	587.57	459.33
1974	164	-26.20	-111.58	-12.40	341.28	191.09
1975	180	-15.56	-104.87	-12.40	293.79	160.96
1976	191	-15.45	-126.62	-12.40	309.44	154.98
1977	202	-14.59	-86.03	-12.40	318.28	205.25
1978	219	-20.70	-71.44	-12.40	420.22	315.68
1979	250	-31.99	-60.29	-12.40	486.47	381.79

a/ Steers wintered at a gain of 1.0 lb/day and summered at 1.4 lb/day.

Combination Winter-Summer Steer Budgets - October Sale<sup>a/</sup>

<u>Year</u>	<u>Index</u>	<u>Interest</u>	<u>Feed Cost</u>	<u>Other Cash Costs</u>	<u>Steer Value</u>	<u>Total Budget</u>
1949	73	\$-27.27	\$-102.40	\$-16.25	\$573.88	\$427.95
1950	75	-30.04	-107.28	-16.25	713.17	559.60
1951	82	-35.11	-84.27	-16.25	785.02	649.38
1952	84	-34.54	-86.11	-16.25	594.89	457.99
1953	81	-23.14	-86.40	-16.25	419.04	293.25
1954	81	-22.29	-87.62	-16.25	465.92	339.76
1955	81	-20.39	-89.71	-16.25	451.38	325.03
1956	81	-20.62	-86.11	-16.25	445.28	322.30
1957	84	-23.82	-70.26	-16.25	494.80	384.47
1958	86	-29.81	-72.36	-16.25	580.00	461.58
1959	87	-30.71	-86.64	-16.25	553.14	419.54
1960	88	-30.67	-74.38	-16.25	485.67	364.37
1961	88	-25.82	-80.41	-16.25	502.78	380.30
1962	90	-25.96	-76.76	-16.25	529.31	410.34
1963	91	-24.58	-75.53	-16.25	474.64	358.27
1964	92	-22.08	-93.32	-16.25	408.57	276.92
1965	94	-22.49	-85.17	-16.25	466.71	342.80
1966	98	-25.34	-77.53	-16.25	468.79	349.68
1967	100	-26.39	-77.21	-16.25	456.39	336.55
1968	104	-26.52	-74.92	-16.25	459.72	342.04
1969	109	-31.08	-71.96	-16.25	488.10	368.81
1970	114	-36.48	-68.25	-16.25	477.67	356.69
1971	120	-28.75	-63.55	-16.25	492.03	383.48
1972	125	-29.45	-71.44	-16.25	570.74	453.60
1973	144	-40.84	-87.19	-16.25	636.10	491.82
1974	164	-35.55	-111.58	-16.25	391.41	228.03
1975	180	-23.28	-104.87	-16.25	371.76	227.36
1976	191	-22.08	-126.62	-16.25	327.48	162.52
1977	202	-21.06	-86.03	-16.25	342.87	219.54
1978	219	-30.90	-71.44	-16.25	490.41	371.82
1979	250	-45.52	-60.29	-16.25	524.30	402.24

a/ Steers wintered at a gain of 1.0 lb/day and summered at 1.2 lb/day.

