Replacement Heifers – The Economic and Financial Considerations

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Introduction

Operating a profitable beef cow herd requires considerable management expertise. Profitable beef cow operators concentrate their management energies on those factors that (1) make a big difference in profitability of the beef cow herd and (2) can be influenced with management. The typical beef cow operator holds back approximately 30 to 40 percent of all heifer calves born for herd replacements. The management decision to raise or purchase replacement heifers clearly meets both of the above management criteria.

The purpose of this paper is to provide practicing veterinarians a recommended procedure for determing their clients' cost of raising replacement heifers. With these costs in mind, practicing veterinarians can play a major role in helping beef cow operators make profitable replacement heifer decisions.

Total Costs of Raising a Replacement Heifer

This fall's weaned heifer calves are potential candidates for replacement heifers in the 1992 spring calf crop. The projected total cost of raising a 1992 bred replacement heifer is at a record high. Costs from conception to weaning are projected at $408, costs from weaning through breeding are projected at $150, and costs for summer grazing period after breeding through fall pregnancy check are projected at $88. After adjusting for heifer conception rate and the value of cull open heifers, the total cost of raising replacement heifers is projected to be $656 per replacement heifer (see Table 1). Fifty-eight dollars of this cost accounts for the time value of money; i.e., the interest cost. This $656 covers the projected costs from conception of the cow producing the heifer until the heifer's pregnancy check 27 months later.

The more open females, the higher the cost of raising replacement heifers. The net cost of raising both replacement heifers that get bred and those that are not settled has to be attributed to the bred heifer. The net cost is used because an open heifer has both an added cost and an added income when sold as a cull heifer.

The management of first calf heifers affects their performance for the rest of the animal's life. Inadequate management of replacement heifers can result in larger feed bills and/or more open females. Each of these management items will directly affect the costs of raising replacement heifers.

Table 1. Projected Cost of Raising Medium Framed Replacement Heifers (1990-92)

1. Conception To Weaning	$408
2. Weaning To Breeding	$150
3. Breeding to Pregnancy Check	$88
Sub-Total	$646
4. Adjusted For Heifer Conception Rate (77%)	$839
5. Adjusted For Cull Heifer Credit	$656

Raising Replacement Heifers – A Recommended Procedure

It is recommended that management of replacement heifers be separated into three distinct time periods. The time periods are: (1) from cow conception to weaning of its heifer calf, (2) from weaning until breeding of the replacement heifer and (3) from breeding until fall pregnancy check. After pregnancy check, the bred heifer is assumed to be added to the cow herd. It is the author's opinion that the additional $120 cost of wintering the bred heifer from pregnancy check until grass next spring should be charged against the cow herd and not the heifer replacement enterprise. This author also recognizes that producers tend to think of replacement heifers from birth to birth rather than conception to conception; however, it is my recommendation that costs of replacement heifers be allocated to the heifer enterprise from conception to conception.

Period One - Conception to Weaning

It is important that cattlemen take care in selecting their heifer replacements from their potential heifer pool. Heifers born early in the calving season are usually heavier

at weaning and reach puberty earlier than heifers born late in the calving season. Weaning weights of calves are positively correlated with milk production of their dams; therefore, selection of growthy, fast gaining heifers is also a selection for milk production. Conformation and condition should also be taken into account. Research suggests that heifers with excess condition will have more difficulty calving, will produce less milk, and will have a lower lifetime production than heifers in moderate condition.

Costs of Production in Period One

The costs associated with the first time period (conception to weaning) can be estimated by using the opportunity cost concept. Opporutnity cost is the value of a resource in its highest valued alternative. For example, the heifer calf could be sold in the fall rather than retained as a potential heifer replacement. The income that is foregone by *not* selling the calf is the opportunity cost; i.e., the cost of giving up the opportunity to obtain the sales income of the calf.

In this example, it was assumed that the heifer calf, weighing 425 pounds, *could* have been sold for $96 per hundred weight for a total of $408 per head. Total costs for the conception to weaning time period is projected to be a $408 opportunity cost of *not* selling the heifer calf.

Period Two - Weaning to Breeding

Proper precautions should be taken in the selection of replacement heifers and the development process to ensure that heifers will cycle and settle in the shortest period of time in the breeding season. If they do not become pregnant, *and not all of them will,* these costs must be borne by those heifers that do conceive and calve as two-year-olds.

The second period covers from weaning to the time that the heifer is bred as a replacement. This perod covers a winter feeding period and one month's pasture. Costs in this second time period include winter feed and one month of pasture, veterinarian and medical supplies, fuel, death loss, and miscellaneous expenses. Let's first concentrate on the winter feeding period.

Heifers must be bred at 14-15 months of age to calve as two-year-olds. Heifer calves are expected to reach puberty at approximately 65 percent of mature weight. One critical management variable is the weight at breeding time. Table 2 suggests the weight that must be achieved for puberty at 14-15 months of age. Individual weights rather than group weight should be considered particularly if there is wide variation in birth dates.

Feeding heifers to gain 1.4 pounds per day will result in most medium framed heifers reaching the puberty weight by 14-15 months of age. Large framed heifers may need to gain 1.6 pounds per day to reach puberty by 14-15 months of age.

Table 2. Impact of Mature Weight on Weight at Puberty

Mature Weight	Weight At Puberty
900	585
1000	650
1100	715
1200	780
1300	845

If heifers are weaned in November and bred in June, they have about 210 days to gain the weight. Heifers going to pasture May 1 have a winter feeding period of approximately 180 days. Pasture gains of 1.3 to 1.4 pounds per day can be expected. Feeding 3 to 5 pounds of grain while breeding on pasture or grass may be necessary when pasture conditions are not ideal.

In order to reach a target weight at breeding, cattlemen need to estimate the target average daily gain needed during the winter feeding program. Table 3 calculates the target average daily gain needed for a typical heifer wintering program. It first adjusts the target breeding weight for the one month's pasture gain and then calculates the needed gain during the winter feeding period. In this example, the target breeding weight is 715 pounds. When this is adjusted for pasture gain, the target weight needed at the end of the winter feeding period is 675 pounds. With a projected 181 day winter feeding period, this figures out to a target average daily gain of 1.38 pounds for the winter feeding program.

Table 3. Beef Heifer Replacement

BEEF HEIFER REPLACEMENT TEMPLATE	
Weaning Weight of Heifers	425
Weaning Date	11/ 1/90
Mature Weight Of Cows	1100
Target Breeding Wt	715
Gain needed to breed	290
Date To Grass	5/ 1/91
Target Breeding Date	6/ 1/91
Days On Grass	31
Target ADG on Grass	1.3
Days On Winter Feed	181
Target Winter Gain	250
Target Weight To Grass	675
Target Winter ADG	1.38

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Data from the actual ration and the grower simulation presented in Appendix 1 were used to project the total winter feed required to winter a replacement heifer. The total feed program (Table 4) consists of 27.4 bushel of barley, 0.33 tons of mid bloom alfalfa hay, 0.48 tons of mature grass hay, and 1.79 pounds of di-calcium phosphate mineral. The relatively high level of concentrate in the ration was triggered by th relatively low priced concentrates and relatively high priced forages.

Projected feedlot costs for the wintering period are presented in Table 5.

Table 4. Calculating Total Winter Feed Requirements Per Head

<---------- RATION --------->			--- FEED---
----- Feed ----	MOISTURE	DM LBS/DA	USED PER HEAD
CORN GRAIN	14.00%	.00	.00 BU
BARLEY GRAIN	14.00%	6.33	27.40 BU
ALFALFA	10.00%	3.30	.33 TON
Phs DICAL	.00%	.01	1.79 LBS
GRASS HAY	10.00%	4.86	.48 TON
TOTAL DRY MATTER	89.56%	14.50	2591 LBS
AS IS POUNDS		16.19	2893 LBS

Table 5. Projected Winter Feedlot Costs

<---------- FEEDLOT ---------->		
COSTS	PER HEAD	$/LB GAIN
FEED COST	$83.17	$.33
LOT COST	$18.10	$.07
INTEREST	$24.33	$.10
VET & MED	$2.84	$.01
_____	$.00	$.00
_____	$.00	$.00
DEATH LOSS	$5.74	$.02
TOTAL	$134.18	$.54

Feed costs represent the majority of the winter production expenses and are projected at $83.17 per head or $0.33 per pound gained. The non-feed costs (lot costs and fuel $18.10, interest $24.33 (initial animal only), veterinarian and medical supplies $2.84, death loss $5.74 fuel) total $51.01 giving a total wintering cost of $134.18 per head. This projects a $0.54 per pound cost of gain during the wintering period.

A month of pasture costs plus some additional grain is assumed prior to breeding June 15, 1991. These costs are projected as follows:

Pasture ($9/AUM x 0.9 AUM)	= $8.10
Feed (3 lbs grain/day@$0.0375 (3 x .0375 x 30 days)	= $3.38
Interest on previous investment ($408 plus $144 for 1 month)	= $5.52
TOTAL	$17.00

Total costs to produce a replacement heifer calf from weaning to breeding are estimated to be $151 ($134 plus $17.00).

Period Three – Breeding to Pregnancy Check in Fall

The third period associated with raising replacements is the five months of additional pasture running from breeding to fall pregnancy check. This period is assumed to be five additional months of pasture. At $9 per AUM and assuming a yearling heifer requires 0.9 AUMs this figures out to:

$$\$9.00 \times .9 \times 5 \text{ months} = \$40.50$$

Breeding costs are estimated at $20 per conception and the time value of money for this five months ($408 plus $151 for five monts at 12 percent interest) comes to:

$$(\$408 + \$151) \times (5/12) \times .12 = \$27.95$$

This brings the total cost of period three to $88.40 ($40.50 + $20.00 + $27.95) per replacement heifer.

Total Cost of Raising Replacement Heifers

This gives a total projected cost of raising heifers from conception of the heifer until pregnancy check 27 months later of $646 (see Table 1).

Adjusting for Heifer Conception Percentage

In order to insure that a bred heifer (rather than just a heifer) is available to replace a culled cow, cattlemen will need to raise extra replacement heifers to correct for heifer conception rate. Table 6 provides some suggested research-based conception rates based on average weaning weights of the total heifer herd that can be used to adjust the $646 for heifer calving rate. In reality, producers would select their larger heifers for replacement heifers so the smaller ones should be eliminated because of size.

The first two columns of Table 6 presents some research giving percent calf crop for alternative weaning weights. The third column used the conception rate to calculate the number of replacement heifers that need to be

exposed to the bull to get one pregnant heifer.

The total cost $646 (from Table 1) can be adjusted for heifer calf crop by dividing the $646 cost by the calving percent. This example illustrates the cost of growing a 425 pound medium framed heifer calf into a replacement heifer. Using the heifer calving percentage suggested for that weight in Table 6, the adjusted cost of raising the replacement heifers is $839 per head; i.e.,

$$\$646/0.77 = \$838 \text{ per head}$$

The adjusted cost of raising replacement heifers for alternative heifer weaning weights are presented in Table 6.

Since not all heifers conceive, the unbred heifers will need to be culled. Table 6, column 6, adjusts the cost of raising replacement heifers by the value of the unbred cull heifers (column 5). The cull heifers are assumed sold off grass at 875 pounds at $70 per hundred weight. Typically, 875 pound grass heifers are overweight for feedlot heifers and will generally experience a price discount. Since 1.3 replacement heifers are needed for the one bred replacement heifer needed, we have .3 cull heifers to sell. This .3 heifer (875 lbs x 0.3 = 262 lbs) is valued by multiplying $70 per hundred weight times 2.62 hundred weights giving a $183 cull heifer credit. This reduces the total cost of raising the example replacement heifer to $656 per bred replacement heifer.

Comparing Costs of Raising to Projected Cost of Purchasing Replacement Heifers

As illustrated in Table 6, the cost of raising replacement heifers is dependent on percent heifer conception and where we are in the cattle price cycle. Once again, economic effects can override the biological effect (see my other paper published in this proceedings entitled "Economics of Reproductive Efficiency in Beef Cow Herds"). Costs of raising replacement heifers tends to lag the cattle price cycle by two years; therefore, we have to take into account both the biological and the economical impacts of selling 875 pound cull heifers. As we approach the turning point in the price cycle, producers should carefully predict the cost of their replacement heifers two years down the road.

When the market value of the cull heifer is higher than the cost of raising the heifer, the higher conception rates have the higher cost of replacement heifers. This was the case in 1988 and applied in general during the upward part of the cattle price cycle (1986-1989). This means that the lower costs of producing replacements was associated with the lower heifer conception rates. This is counter to most expectations and production recommendations.

When the market value of cull heifers is less than the cost of raising replacement heifers, as in the current case, the higher conception rates will have the lower costs of replacement heifers. As we enter into the downward price cycle in the early 1990's, the market value of cull heifers is projected to be less than the costs of replacement heifers; therefore, the more traditional recommendations of higher heifer conception rates will reduce the cost of replacement heifers.

The Economic and Financial Considerations

Cost Summary

The costs of raising replacement heifers is at an all-time high. I am projecting that raising a medium framed fall 1990 weaned calf to be a replacement heifer that calves in spring 1992 will cost $656 per head. This total can be broken down to costs from conception to weaning are projected at $408, costs from weaning to breeding are projected at $150, and the costs from breeding until pregnancy check in the fall is $88. This gives a total projected cost of raising replacement heifers at $646 (see Table 1). Fifty-eight dollars of this cost accounts for the time value of money; i.e., the interest cost. When this $646 is adjusted for heifer conception rate (see Table 6), the projected total cost of raising replacement heifers ranges from $650 to $663.

Table 6. Adjusting Replacement Costs for Heifer Conception Rate

WEANING WEIGHT	% HEIFER CALF CROP	HEIFERS NEEDED FOR REPLACEMENT REPLACEMENTS	COST OF $646.00	CREDIT 875# CULL HEIFER $70.00	NET COST OF REPLACEMENT HEIFERS
350	69%	1.45	$936	$275	$661
351-399	67%	1.49	$964	$302	$663
400-449	**77%**	**1.30**	**$839**	**$183**	**$656**
450-499	87%	1.15	$743	$92	$651
500-500	90%	1.11	$718	$68	$650

TEMPLATE = HEIFER2.CAL ON DISK #40 & #78.

If wintering cost from pregnancy check until calving is included, another $100 could be added giving a total cost of $750-$775 per replacement heifer. I am currently projecting that the market price of medium framed bred heifers in February will be in the $750-$800 range.

The economic value of a bred heifer is the net income that she generates over her life in the herd plus her salvage value at the end of the seventh year. This suggests a planning horizon of seven years. Each year's net income and the final salvage value have to be discounted back to present dollars. Another economic study that I have completed projects the economic value of a medium framed bred heifer, entering the beef herd in February 1990 and that has seven consecutive calves, was $843 per head. If the bred heifer misses the second calf, as is fairly common, the projected value was $603 per head. Clearly, the second calf has to be born to be profitable.

Raise or Purchase Replacement Heifers?

The age old question of should a cattleman raise or purchase replacement heifers needs to be answered individually for each cow-calf producer. The recommended procedure is to prepare a written production plan for the beef cow herd with raised replacement heifers and a second production plan with purchased replacement heifers. By comparing the bottom lines of the two production plans, cattlemen can see which replacement strategy maximizes "his" economic returns to the cow herd.

Cattlemen are advised that there are two kinds of production plans that cow-calf producers should utilize. The first is an "economic plan" based on opportunity costs. The second is a "cash flow plan" based on out-of-pocket costs. It is essential that cattlemen understand the distinction between opportunity cost plan and the cash flow plan.

The economic plan is based on the assumption that

Table 7. Cost/Return Summary for Raising Replacements
100 Cow Herd With 19 Replacement Heifers

CASH FLOW		OPPORTUNITY COST
$41,083	Receipts	$41,083
$12,212	Less Feed and Livestock Expenses	$27,777
$28,871	Returns Above Variable Costs	$13,306
$1,365	Less Fixed Expenses	$2,644
$27,506	Returns to Labor & Mgt, & Equity Capital Per Herd	$10,662
$410.83	Total Receipts Per Cow	$410.83
$135.77	Total Expenses Per Cow	$304.21
$275.06	Returns to Labor & Mgt, & Equity Capital Per Cow	$106.62

Table 8. Cost/Return Summary for Purchasing Replacements
100 Cow Herd With 19 Replacement Heifers

CASH FLOW		OPPORTUNITY COST
$46,955	Receipts	$46,955
$12,203	Less Feed and Livestock Expenses	$25,119
$34,752	Returns Above Variable Costs	$21,836
$13,965	Less Fixed Expenses	$4,694
$20,787	Returns to Labor & Mgt, & Equity Capital Per Herd	$17,141
$469.55	Total Receipts Per Cow	$469.55
$261.68	Total Expenses Per Cow	$298.14
$207.87	Returns to Labor & Mgt, & Equity Capital Per Cow	$171.41

the cow herd has to pay the "opportunity cost" of the resources used. That is, if the local elevator will pay $1.30 for oats, then the cow herd should be charged the $1.30 opportunity cost of the oats fed to the cow herd. This opportunity cost concept should be utilized for all resources depleted by the cow herd.

The "cash flow budget" calculates only the out-of-pocket costs that a beef-cow producer incurs. For example, if the beef-cow producer raises the oats fed to the cow herd, only the out-of-pocket production costs are charged to cash flow costs in the cow herd.

If the cow herd is being operated with equity capital, cash costs will generally be less than opportunity costs. If the cow herd is being operated with borrowed capital, cash costs will include both interest and principal payments and may be more than opportunity costs. Since each cattleman's equity position is different, each cattleman needs to tailor his written beef-cow production plan to his unique equity situation.

Tables 7 and 8 present an "economic plan" on the right and a "cash flow plan" on the left for a 100 cow herd. Table 7 assumes that the replacement heifers are raised and Table 8 assumes that the replacement heifers are purchased for $750 as bred heifers.

Comparing the summaries of these two plans points out the typical economics of raising or purchasing replacement heifers. From a profitability standpoint, these plans suggest that profits are increased by purchasing replacement heifers (see right-hand side of budget summaries). Cash flow, on the other hand, is decreased by purchasing replacement heifers (see left-hand side of budget summary). While gross receipts are increased by selling all heifer calves, replacement heifers must also be purchased. Net cash flow is projected to be the highest for raising replacement heifers.

Detailed written plans for a beef cow enterprise raising replacement heifers and a beef cow production plan for purchasing replacement heifers are available from this author. Space does not permit me to publish them here.

Since most cow-calf producers are typically more concerned about cash flow than they are about profits, cow-calf producers generally prefer to raise their own replacement heifers.

Word of Caution

The margin of error in properly raising replacement heifers is small. If the heifers are fed too little they will not become pregnant at the appropriate time and they will not have their first calf at two years of age. If heifers are fed in excess they will become fat, decrease their productive life and create unnecessary production costs. Therein lies the challenge to the cow-calf producer and to his local veterinarian.

Appendix 1

Ration Formulation & Grower Simulation

Projecting Winter Feed Costs for Replacement Heifers

Feed accounts for a majority of the costs during the wintering period; therefore, it is mandatory to feed them as cheaply as possible without being detrimental to the replacement heifers' final breeding performance. The ration formulated in this publication is based on a least-cost balance ration.

Rations are formulated for a specific target weight. The target weight was derived by adding together the weaning weight and the desired end of the winter feeding period weight and dividing by 2; i.e.,

$$(675 + 425)/2 = 550 \text{ lbs}$$

Dry matter intake was projected at 2.6 percent of body weight giving a projected average dry matter intake of 14.5 pounds per day.

The following feeds and their prices were used in this example ration:

Barley	$1.80/Bu
Alfalfa (mid bm)	$55.00/Ton
Grass Hay (mature)	$55.00/Ton

A heifer grower ration was generated using the above feeds to provide the lowest cost balanced ration meeting the nutrient requirements of the heifer (see Table 1). With relatively low priced grain, compared to price of forages, this least-cost balanced ration is approximately 44 percent grain and 56 percent forage. The total cost per ton of this feed comes to $64.26. On a dry matter basis the ration costs $3.21 per hundred pounds of dry matter.

Table 2 presents: (1) the recommended nutrient requirements for a 425 pound heifer to gain 1.38 pounds per day to obtain the desired 675 pound at the end of the winter feeding season and (2) the nutrient content of the suggested least-cost balanced ration. The ration was required to be 10.5 percent crude protein, have 41.47 mega-calories of net energy for gain (NEG), have a calcium level between 0.35 and 2 percent, and have a minimum phosphorus level of 0.35 percent. The recommended calcium/phosphorus ratio is to be between 1:1 and 3:1.

The net energy for gain (NEG) of the ration and the dry matter intake of the heifer calf heavily determine the heifer's average daily gain (ADG) through the winter feeding period. Table 3 suggest dry matter intake levels for different weight replacement heifers. This ration was based on 14.5 pounds of dry matter intake per day.

Table 1. AGNET's Feedmix Ration #8 for 500-700 lb Heifers
(1-1.3 lb ADG)

FEED NAME	YOUR PRICE	LB/HEAD/DAY----> DRY	AS FED	<--RATION (%)---> 100% DRY	AS FED	COST PER DAY
BARLEY	$1.80	6.33	7.10	43.64	43.92	$.23
ALF HAY MB	$55.00	3.30	3.67	22.76	22.65	$.10
PHS DICAL	$300.00	.01	.01	.04	.04	$.00
GRASS HAY	$50.00	4.86	5.41	33.56	33.39	$.14
TOTALS		$14.50	16.19	100.00	100.00	$.47

RATION COSTS	DRY BASIS	AS FED BASIS	MOISTURE
==========>	$3.21 /CWT	$2.88 /CWT	10.44%
	$64.26 /TON	$57.55 /TON	89.56% DM

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Table 2. Nutrient and Quality Analysis for This Mix

	REQUIREMENT NAME		100% DM REQUIRED	ACTUAL		LBS DM/DAY BASIS REQUIRED	ACTUAL
1	WEIGHT	EQ	100.00	100.00		14.50	14.50
2	CRUDE PROT	MIN	10.50	10.50		1.63	1.63
3	**NEM**	**MIN**	**0.0**	**68.77**	**<=====**	0.0	10.66
4	**NEG**	**MIN**	**41.47**	**41.47**	**<=====**	6.43	6.43
5	TDN	MIN	0.0	64.63		0.0	10.02
6	CALC	MAX	2.00	0.75		0.31	0.12
7	PHOS	MIN	0.25	0.25		0.04	0.04

Table 3. Suggested Dry Matter
Heifer Growing Rations
(lbs feed - dry basis)

BODY WEIGHT (LBS)						
300	400	**500**	**600**	700	800	900
8.5	11.5	**13.5**	**15.5**	17.5	19.5	21.0

Source: AGNET's Feedmix "help" printout.

Simulating the Growth of the Replacement Heifer with Specific Ration Adjusted to North Dakota's Weather Conditions

The AGNET gain projector program called BEEF was used to project the feedlot performance and the associated production costs of growing the replacement heifer during the winter feeding period. The gain projection was based on the following inputs:

1. Carrington, North Dakota 10 year average weather data
2. 10 cents per day non-fed costs
3. $96/cwt heifer value
4. 11.25% interest rate
5. Initial weight -- 425 pounds
6. Final weight -- 675 pounds
7. Frame score -- 2.0 (out of a possible 4) for medium frame
8. Condition score -- 2.0 (average)
9. Ten day adjustment period
10. NEG = 41.47 Meg Calories/cwt
11. NEM = 68.77 Meg Calories/cwt
12. Lot conditions (mud factor = 0) dry lot
13. Feed cost in $/cst of dry matter = $3.21
14. Began feeding on Nov. 1, 1990

The heifer growth simulation suggests that this particular ration projects a 1.38 pound average daily gain, adjusted for Carrington's average winter weather, for the entire feeding period (see bottom of Table 4).

The average dry feed intake is projected to be 14.31 lbs/day giving a projected total dry matter feed need of 2591 pounds for the winter feeding period. The average feed conversion efficiency is projected to be 10.35 lbs of dry feed per pound of gain.

Table 4. Projected Feedlot Performance
Carrington, North Dakota 1991

START DATE	11/ 1/90	START WT=	425	END WT=	675	LBS
INTEREST %	12	% PUR PR	$96.00	LOT COST	.10	PER DAY
BARLEY PRICE	$1.80	HAY $/T	$55.00	SHRINK =	.00%	
RATION COST	$3.21	NEM =	68.77	NEG =	41.47	
VET & MED/HD	$2.84	MKT COST	$.00	HAULING=	$.00	/ CWT
DEATH LOSS	1.00%	SELL PR	$85.00	BUY/SELL	$-11.00	

DATE	AVE. TEMP	CURRENT FEEDLOT WEIGHT	<--- GAIN ----> THIS PERIOD	AVERAGE TODATE	AVE DRY INTAKE	AVERAGE EFFIC.	COST/LB OF GAIN THIS PERIOD	TO DATE	TOTAL COST PER PERIOD
11/ 1/90	* *	425.00	* * *	* * *	* * * *	* * *	* * * *	* * *	* * * *
11/ 7/90	36	428.90	.56	.56	11.97	21.48	$1.12	$1.12	$4.36
11/21/90	28	447.67	1.34	1.08	12.31	9.18	$.49	$.39	$7.31
12/ 5/90	21	466.37	1.34	1.18	12.70	9.51	$.50	$.44	$7.55
12/19/90	15	484.70	1.31	1.22	13.07	9.98	$.53	$.47	$7.89
1/ 2/91	11	502.40	1.26	1.23	13.43	10.62	$.56	$.49	$8.36
1/16/91	10	519.75	1.24	1.23	13.77	11.11	$.58	$.51	$8.72
1/30/91	9	537.92	1.30	1.24	14.12	10.88	$.57	$.53	$8.54
2/13/91	10	556.68	1.34	1.25	14.48	10.81	$.57	$.54	$8.48
2/27/91	14	576.09	1.39	1.27	14.84	10.70	$.56	$.54	$8.40
3/13/91	20	596.31	1.44	1.29	15.22	10.54	$.55	$.55	$8.28
3/27/91	27	617.40	1.51	1.31	15.60	10.36	$.54	$.55	$8.15
4/10/91	34	639.36	1.57	1.33	15.99	10.19	$.54	$.55	$8.03
4/24/91	42	662.11	1.63	1.35	16.38	10.08	$.53	$.55	$7.95
5/ 1/91	49	675.41	1.90	1.38	16.68	8.78	$.47	$.55	$3.72
181 DAYS			TOTAL	250	2591.00				
			AVERAGE	1.38	14.31	10.35			

HFRG425.CAL ON DISK #78