THE EFFECT OF MANAGEMENT OPTION ON THE PERFORMANCE OF PREGNANT FEEDLOT HEIFERS

by

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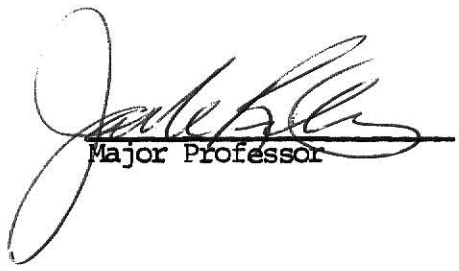

Major Professor

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LITERATURE REVIEW

One of the major points considered by any cattle feeder when purchasing feeder cattle is their ability to gain economically, regardless of their sex. Several researchers have studied the effect of sex, breed, and nutrition level on average daily gains. A study by Clanton et al. (1983) was designed to determine the effect of rate and timing of gain on the development of beef heifers. Angus X Hereford heifer calves were fed from weaning to breeding using three different feeding regimes. One group was fed to gain no weight the first half of the period and gain .91 kilograms per head per day during the last half. Another group was fed to gain .45 kilograms per head per day the entire period. Finally, the third treatment was for heifers to gain .91 kilograms per heifer per day in the first half and no gain in the last half of the period. The diet was the same for all treatments, but intakes were altered to achieve desired weight gains. The researchers found that the heifers actually gained weight during maintenance periods, suggesting that the net energy system does not indicate that animals are more efficient in utilizing energy at maintenance. The results also showed larger than predicted gains for heifers during period two of the first treatment emphasizing that the net energy system does not account for compensatory gain. Increased heart girth sizes displayed by heifers during the weight gaining periods indicate that much of the gain was due to soft tissue growth. At the end of the study, there were

no significant differences in weight, heart girth, or wither height suggesting the main concern in growing heifers is to achieve the lowest cost per pound of gain possible.

Bowden (1977) did a study involving four types of F_1 heifers fed at two levels of nutrition during and prior to gestation. Body measurements, consisting of width and height, were taken at one year of age as well as 8.5 weeks after calving. When compared, heifers on a ten percent higher D.E. intake ration exhibited an increase in heart girth, chest width, chest depth, and hip width indicating an increase in soft tissue deposition rather than skeletal growth. In addition, this higher plane of nutrition increased the average rate of gain by twenty-two percent more than the heifers fed for a "normal" growth curve.

While studying the net energy system and its application to growing and finishing beef cattle, Lofgreen and Garrett (1968) showed that heifers deposit more energy per unit of gain than steers and the difference is larger at higher rates of gain. In other words, heifers deposit fatty tissue at a faster rate relative to muscle and bone tissue than do steers.

In another study by Ritchie et al. (1977), heifers were slaughtered eighty-three days before bulls and steers, yet the average daily gains, carcass cutabilities and quality grades were comparable. This data agrees with several trials in suggesting that when heifers are fed to a proper endpoint, performance and carcass traits of steers and heifers are approximately equal. The fact that heifers deposit fat earlier should have some affect on management decisions in a feedlot situation.

In any facet of animal production, the producer must be concerned about the effect of feeding management on the availability of the nutrients provided by the ration. Numerous trials have been conducted to study this effect. An example of such a trial is the study conducted by Iwaski et al. (1979) on the nutrient requirements of pregnant Japanese Black cattle. It simply showed that energy digestibility increased at a higher level of feeding. This is an important note as high energy rations are used for finishing cattle in feedlot operations. Furthermore, stage of pregnancy did not affect energy digestibility or energy losses in the urine.

FEED EFFICIENCY AND UTILIZATION:

Feed cost is larger than any other single operating expense in most livestock operations. Therefore, the efficiency of feed conversion is an extremely important factor to any cattle feeder. Economically speaking, it would be useless for a heifer to gain rapidly if a large percentage of nutrients are also excreted in the feces.

Balch (1976) explains there are three major effects of ruminant digestion on the animal's response to feed. By changing consumption, by determining the degree of nutrient utilization from the feedstuffs, and by altering the nature of the nutrients obtained. Maximum digestible energy intakes were achieved in heifers when the ration contained about ninety percent concentrates.

There are several factors affecting energy utilization by the animal such as chemical composition and physical form of the ration, species of animal fed, and the function of the animal at that particular

period. Another important factor is the composition of gain which will be discussed later in the text.

Frequently, as Blum (1976) notes, feeding efficiency is measured by one of two ratios; the ratio of feed consumed per pound of gain, known as feed efficiency, or its reciprocal commonly called feed conversion.

As mentioned earlier, to determine the ration needed in any feeding situation, the nutrient requirements of that animal must be computed first. The amount of energy available for production (growing, fattening, lactation) is found by subtracting the energy required for the animal's basic maintenance from the energy provided by the feedstuffs. Net energy is the sum of maintenance and production requirements and the ration must sufficiently provide this energy. Leroy (1970) and Demchenko (1967) showed that the less digestible the ration, the greater is the difference between metabolizable energy and net energy. Thus, feed efficiency is adversely affected.

In one particular study, Danner et al. (1980) produced results which agreed with previous trials. They fed exotic and British bred heifers and steers three different rations varying in energy levels. As the percentage of corn in the total diet increased, so did average daily gains. In addition, smaller type cattle utilized a low energy diet, in terms of carcass retail production value, better than larger framed exotics because they consumed more feed per unit of weight.

Ferrell et al. (1976) conducted a study designed to observe energy utilization during pregnancy using ninety Hereford heifers. Pregnancy had no effect on the digestible energy of the diet or the

energy lost as methane. However, there was an increase ($P<.05$) in urinary energy loss due to pregnancy. The data in this trial indicate that any difference in the energy digestibility due to pregnancy is of little importance relative to differences due to the level of feeding.

Flatt et al. (1967) summarizes the work of several researchers in a report on pregnancy and ration composition influences on energy utilization. Many studies suggest that an animal's maintenance requirement increases as the ration digestibility decreases or percent protein in the ration increases. This may be due to two reasons: (1) it takes more energy to breakdown peptide bonds than it does to synthesize ATP, as stated by Webster (1974) and (2) a lower level of digestible nutrients may delay rate of passage therefore, prolonging basal metabolism. Total heat production increased considerably during the latter stage of gestation. Rate of passage of digesta through the entire digestive tract increased as pregnancy progressed. This could result in decreased digestibility of the feedstuffs, but the degree of depression would depend on the chemical and physical properties of the ration. The efficiency of utilization of metabolizable energy for reproductive gain is less than that for fattening. All of these factors would certainly affect feed efficiency.

In two consecutive studies by Sedlakova et al. (1978 and 1981), the effect of nutrition level on performance of pregnant heifers was studied. While pregnancy had little or no influence, the higher energy ration increased birthweight of the calves and improved feed efficiency.

CARCASS TRAITS:

While feedlot managers are mainly concerned with achieving gain at optimum economic efficiency, they should also realize that carcass characteristics of the finished product are major factors in determining its value. The consumer acceptance of retail beef cuts make desirable carcass grades economically important to cattle feeders. Therefore, trials concerned with determining the effect of various treatments on the performance of finishing cattle should also note the treatment's effect on carcass traits.

In a study by Marion et al. (1980), body type and level of nutrition affected the carcass traits of steers and heifers. Large framed cattle had lower yield grades, less fat and more crude protein while smaller, earlier maturing cattle showed more fatty tissue, less protein, and consequently higher yield grade numbers. As the ratio of available energy to liveweight gain increased, feed conversion, yield grade, and carcass fat increased. Interestingly enough, quality grade was not significantly different in any of the treatments.

Danner et al. (1980) altered the feeding regime of steers and heifers and found as the energy level of the ration increased, so did backfat as expected. They also found that when adjusted to a constant carcass weight, higher energy levels increased fat thickness and decreased percentage of retail cuts with no affect on quality grade in steers or heifers.

A study by Ritchie et al. (1977) which was discussed earlier, would support a theory of superior feed conversion efficiency for heifers when compared to steers or bulls. Their heifers were slaughtered

at lighter weights and younger age, yet exhibited carcass traits nearly identical to steers and considerably fatter than bulls. This emphasizes the importance of carcass composition to cattle feeders.

When ten heifer pairs, an open and pregnant heifer in each pair, were fed the same ration, no difference was found in dressing percentages or quality grades of the carcasses due to pregnancy. The ration used in this trial was a high energy feed consisting of grain, one pound of linseed meal and ten pounds of corn silage. The amount of ration fed was determined by the heifer with the smallest appetite within each pair. Snapp and Bull (1944) showed in their study that the carcasses of bred heifers contained twenty percent more fat, five percent less lean, and ten percent less bone, indicating that pregnancy shortens the time needed to achieve a satisfactory marketing stage. They conclude that the breeding of heifers which are to be for about five months is sound practice. Furthermore, if heifers are slaughtered five months pregnant, the discounting of these heifers often seen from market buyers is not justified.

Dockerty et al. (1973) designed a trial using forty-six Hereford steers fed two dietary energy levels and further divided into two groups fed different planes of nutrition (continuously full fed versus fed maintenance requirements for six and one-half months then full fed). The data showed that cattle on a temporarily restricted energy ration, perhaps a growing ration, were equal in quality grade to cattle fed a finishing ration the entire feeding period. Backfat, as well as marbling, on steers fed the lower plane of nutrition decreased during the maintenance period, but fat deposition occurred at an increased

rate during later stages of the finishing period. Although yield grade estimates favored those steers fed on the lower plane of nutrition, analysis showed no significant differences in carcass composition.

GROWTH AND DEVELOPMENT:

Compensatory growth is a term often used to describe the above normal growth rate of an animal when the cause of previous growth restriction is removed. "Above normal" is determined by comparison to similar animals of the same chronological age whose growth has not been restricted. A change in rate of growth is a result of an animal's effort to maintain homeostasis. When the body system is challenged, such as a nutritional deficiency, growth rate is retarded. In a study concerning growth rate in dairy heifers, Eckles and Swett (1918) conclude that an animal's tendency to recover is strong following a period of adverse conditions. Additionally, the longer the period of adversity, the less complete the recovery.

Along with nutritional and management effects, hormones can also have a large influence on an animal's growth. This can be an important consideration to feedlot managers because of the wide use of hormones or hormone-like substances in the industry. A hormone effect can also occur from the animal's endocrine system due to alterations in management. Horstman et al. (1982) treated heifers with melengestrol acetate (MGA), ovariectomy, manual abortion, intramuscular estradiol cypionate (ECP), and Prostaglardin F_2 as a means of abortion and estrus control. The ovariectomy decreased average daily gains and was attributed to a decrease in estrogen production. MGA on the other hand, increased

gains and feed efficiency. Although much of the improvement can be accredited to a lack of estrous activity, an increase of estrogens produced by developing follicles also had some affect.

CALVING-RELATED CONSIDERATIONS:

Many times, feedlot managers are faced with heifers too late in their gestation cycle to successfully abort. Depending on the marketing strategy, cattle feeders may have to be concerned with calving difficulties and lactation potential.

Dystocia, delayed or difficult parturition, is an important economic problem in the beef cattle industry as it is the most common cause of perinatal calf death. Small pelvic area in heifers or cows and large calving weights are the two most common causes of dystocia. According to Fleck (1978), calving difficulties occurred more frequently in heifers fed fattening rations. This is due to a higher energy level in the last two months of pregnancy which increased fetal size and increased internal fat deposition which in turn, restricted the reproductive tract. Bond and Wiltbank (1970) also discovered more calving difficulties from heifers fed on a high energy level ration than those fed a lower energy feed. However, other researchers present data indicating different results. Bowden (1977), Laster (1974), and Sedlakova et al. (1978) showed that high pre-calving energy levels did not increase the occurrence of calving difficulties or the length of time of delivery. Corah et al. (1975) also found the heifers fed less energy gave birth to lighter calves, but the calves were born with the same degree of difficulty as those from adequately fed dams.

In cases where the calves are allowed to suckle before they and the heifer mothers are sold, lactation becomes a factor to consider. Swanson (1960) conducted a study using seven pairs of identical twin heifers. One heifer in each pair was fed a normal control ration and the other was fed a high percentage of concentrates to produce rapid gain and fattening. The heifers fed the higher level of nutrition actually produced less fat corrected milk due to a lack of secretory tissue development in the udders. Depressed milk production was also shown in a similar study by Sejrsen and Larsen (1978). However, if major mammary gland development has occurred before a large degree of fat is deposited, high energy rations will increase milk production after parturition as seen by Sedlakova (1978), Bond and Wiltbank (1970), and Turman et al. (1964).

MARKETING:

Large average daily gains and excellent feed efficiency can be attained, but without a means of selling the cattle, feedlots would show little profit. Several marketing strategies are possible and each is affected by numerous factors. Lambert et al. (1983) summarizes the effect of various factors on calf and yearling prices in Kansas. Cattle with some degree of conditioning sold for a premium over thin cattle. When determining the effect of sex on price, steers outsold heifers, but the discount for heifers decreased as weight increased.

Out of several surveys determining marketing method used for finished cattle, most indicate an extremely large percentage of cattle are sold on a liveweight basis. Koons (1977) and Dietrich et al. (1974)

state that ninety-five and over ninety-eight percent respectively of all cattle sold were on a liveweight basis. The remainder percentage were sold under the rail weight and grade basis and are usually problem cattle or those in a special situation. An example of such a situation was described by Lyle Gray, manager of Flinthills Beefeeders, Inc. in Potwin, Kansas. Due to inefficient abortion, heifers above five and one-half months pregnant were not aborted and were either calved out or sold pregnant depending on when they were desirably finished. Any heifers sold before parturition, but showing visual signs of pregnancy were discounted and usually sold on a grade and yield basis.

Special situations may arise requiring management alterations. Therefore marketing strategy is an important consideration in any cattle feeding operation.

SUMMARY

Large commercial feedlots feed fewer heifers today than in the past primarily because of lower performance of heifers when compared to steers. Two main factors are responsible for this reduced performance. (1) The heifers placed in feedlots are generally smaller framed, less desirable, culled heifers from cow-calf operations and, (2) heifers are often pushed past proper endpoints of optimum performance in order to obtain liveweights desired by packer buyers. Nevertheless, heifers will probably remain a significant part of many cattle feeding operations. However, substantial numbers of heifers, especially those arriving during the fall, are pregnant when they are placed on feed and more information is needed to help select the most optimum management system.

In a trial using 105 Angus X Hereford heifers, the effect of five management options on performance of pregnant feedlot heifers was studied. Eighteen heifers were open, 23 were aborted at an average of 83 days pregnant (Abort-early), 24 were aborted at an average of 138 days pregnant (Abort-late), 23 were slaughtered at an average of 167 days pregnant (Pregnant), and 17 were allowed to calve before slaughter (Calve-out). The pregnant group of heifers was the fastest gaining and most efficient group, unless the slaughter weight was adjusted for the 1.7 percent lower carcass yield of the pregnant heifers. After slaughter weights for heifers in all management option groups were adjusted, using the carcass yield of the open heifers, no significant

differences ($P < .05$) existed among heifers in the open, abort-early, or pregnant groups. However, open heifers were 6.7 percent more efficient than pregnant heifers when slaughtered. Heifers in the abort-late and calve-out groups showed markedly lower gains and feed efficiency before and after slaughter weight adjustments.

Carcass quality did not differ among the five pregnancy management options.

When comparing profitability of the five pregnancy management options, heifers in the pregnant group were the most profitable and the abort-late, and the calve-out heifers actually showed losses. If death loss occurs in the calf crop, the calve-out option becomes the least economical.

The data indicate that because of increased carcass yield, packers can afford to pay a premium for open and early aborted heifers. However, if pregnant heifers (sold before visually pregnant) are not discounted and are sold on a liveweight basis, this option may be more profitable because of increased rate of gain and feed efficiency.

INTRODUCTION:

The basic goal of any cattle feeding operation from small family owned operations to large scale commercial feedlots is to attain the greatest profitability available. In other words, to produce kilograms of carcass, at a certain weight, with the lowest cost of production to achieve optimum economic efficiency. This broad statement includes several factors such as average daily gains, feed efficiency, marketing strategies, and labor utilization.

While searching for optimum efficiency, certain management plans have been altered. One of the major changes has been the feeding of proportionally fewer heifers in the cattle feeding industry over time. In a report summarizing management techniques in Texas feedlots, Deitrich et al. (1974) showed only 24 percent of cattle on feed in feedlots the size of 10,000 head or more were heifers. However, it is true that a larger percentage of heifers were fed in small feedlots, but this may be because facilities and labor required for heifer related problems, such as calving difficulty, are more readily available in smaller feedlots. This point will be discussed more thoroughly later in the text.

Possibly the main deterrent to a program of fattening heifers is that packers desire heavier heifers, usually 431.8 kilograms or heavier. Eng (1982) points out that light weight heifers compete favorably with steers from cost per kilogram of gain and feed efficiency standpoints. He also emphasizes that heavier heifers decrease in these values and,

when compared to steers, may become unfavorable to feed. These conclusions are based on several studies including one from the University of California which shows that heifers attained low choice carcass composition 60 days before steers. It also indicated that during the last 98 days, approximately 70 percent of the heifer weight gain was fat. Converting feed to fat is much less efficient than conversion to protein which partially explains a higher cost of gain.

There are other heifer-related problems which may require additional labor and management. An example would be calving out heifers that were too late in their gestation cycle to abort successfully. This and other problems require management and facility changes if a cattle feeder wants to overcome the disadvantages associated with feeding heifers.

The purpose of this trial was to compare five management options for feedlot heifers by measuring average daily gain, feed conversion, and comparative economics for each option.

MATERIALS AND METHODS

One hundred and five Angus X Hereford heifers were purchased at weaning from one Kansas ranch and fed a growing diet from November 21, 1981 until initiation of the feedlot trial on August 31, 1982. Eighteen heifers were left open, 23 were aborted at an average of 83 days pregnant (Abort-early), 24 were aborted at an average of 138 days pregnant (Abort-late), 23 were slaughtered at an average of 167 days pregnant, and 17 were allowed to calve and then fed an additional 49 days (Calve-out). Heifers were fed to approximately the same average slaughter weight in all groups.

The abortifacient used was Alfaprostol at a rate of .7 mg per 45.4 kilograms of body weight. Alfaprostol was in a propylene carrier at a concentration of one mg/cc of carrier.

The open, abort-early, and pregnant heifer groups were fed a finishing diet (Table 1) for 84 days, then slaughtered. The abort-late heifers were fed a growing diet (Table 1) for 56 days at which time they were aborted on October 26, 1982 and then fed the finishing diet for an additional 77 days. The calve-out heifers were fed the growing diet for an average of 191 days and allowed to calve. They were fed the growing diet for an additional 19 days, then were switched to the finishing diet and fed for an additional 49 days.

The 17 calve-out heifers calved between February 15 and March 29, 1983 (average calving date was March 10). In an attempt to reduce

Table 1

INGREDIENT COMPOSITION OF DIETS ON A DRY MATTER BASIS

Ingredients	Growing Diet	Finishing Diet
Rolled Sorghum Grain	23.0%	84.0%
Sorghum Silage	27.5%	10.0%
Alfalfa-Brome Haylage	42.5%	-----
Supplement[1]	7.0%	6.0%

[1]Supplement composition presented in Table 2.

Table 2

INGREDIENT COMPOSITION OF SUPPLEMENT

Ingredients	%
Soybean Meal	60.25
Limestone	16.75
Potassium Chloride	7.00
Dicalcium Phosphate	5.00
Salt	6.50
Urea	2.40
Z-10 Trace Mineral	.50
Vitamin A[1]	.10
Fat	1.50

[1] 30,000 I.U. per gram

the calving interval, five cc of Azium, which contains dexamethasone was used to induce parturition in 13 heifers. The calves were allowed to nurse until they were weaned April 17. After removal of the calves, the dams were fed an additional 30 days in an attempt to produce a liveweight and carcass grade comparable to the other four management groups.

Table 3 summarizes and compares the feeding and management regime of each feedlot heifer option studied in this trial.

In an attempt to obtain more reliable values for rate of gain data, dressing percentages were determined for each heifer and averages calculated. The carcass weight of each group was divided by the dressing percent of the open heifer group to obtain adjusted, more accurate final liveweights.

Each management group was fed in separate feedlot pens without replication. Individual weights were obtained at 4-week intervals for all heifers with the exception of a 4-week post-abortion period for the abort-late heifers which were weighed at 14 and 28 days following injection with Alfaprostol.

Table 3

CHRONOLOGICAL SUMMARY OF EVENTS FOR FEEDLOT HEIFERS IN FIVE MANAGEMENT OPTIONS

	Open	Pregnant	Abort-Early	Abort-Late	Calve-Out
Date trial started	8-31-82	8-31	8-31	8-31	8-31
Date started on growing diet				8-31	8-31
Days on growing diet				56	210
Date started on finishing diet	8-31-82	8-31	8-31	10-26	3-30-83
Days on finishing diet	84	84	84	77	49
Date of Abortion			8-31	10-26	
Avg. Days Pregnant at Abortion			83	138	
Avg. Date of Parturition					3-10-83
Date calves weaned					4-17
Date Heifers sold	11-23-82	11-23	11-23	1-11-83	5-17

RESULTS AND DISCUSSION

Frequently, feedlot managers try to avoid feeding large numbers of heifers in their operation. This is mainly because of the lighter weights of incoming heifers and sometimes lower performance of heifers when compared to steers. Lighter weights of heifers versus steers occur because the larger, more desirable heifers at weaning time are usually kept for replacement heifers. The smaller heifers are culled and often placed in a feeding program to be marketed as finished beef. Harpster et al. (1977) points out that these heifers are probably genetically inferior to their steer counterparts and therefore, a reduction in growth and efficiency is often seen. Although one might expect better, or at least equal, performance of heifers versus steers if the superior heifers were included in fattening programs, the feeding industry is more accurately represented without the growthier heifers. Nevertheless, heifers will always be participants in cattle feeding programs and some situations may necessitate a change in management.

OPEN, PREGNANT AND ABORT-EARLY GROUPS:

The effect of pregnancy management options on the performance of feedlot heifers is shown in Table 4. The pregnant heifers had a significantly ($P < .05$) faster rate of gain than the abort-early and open heifers. In addition, the pregnant heifers showed better feed efficiency than any other group. However, pregnant heifer carcasses yielded 1.7 percent less than the open heifers and 1.9 percent less

Table 4

EFFECT OF PREGNANCY MANAGEMENT OPTIONS ON PERFORMANCE OF FEEDLOT HEIFERS

	Open	Pregnant	Abort-early	Abort-late
Number Head	18	23	24	23
Initial wt., kg.	354.2	354.5	359.1	390
Final wt., kg.	470.8	484.4	473.5	470
No. Days	84	84	84	77
Gain, kg.	116.6	129.9	114.4	80
ADG, kg.	1.39[a]	1.55[b]	1.36[a]	1.04[c]
Daily, D.M. intake, kg.	10.2	10.9	10.97	9.77
Efficiency, D.M./ gain, kg.	7.34	7.03	8.07	9.39
Carcass wt., kg.	286.45	286	288.6	279.56
Dressing percent	60.8	59.1	61.0	59.5
USDA grade:				
No. Prime	1	0	1	0
No. Choice	15	23	23	22
No. Good	2	0	0	1
Adj. Final wt., kg.[1]	470.8	470.4	474.7	459.8
Adj. Gain, kg.[1]	116.6	115.9	115.6	69.8
Adj. ADG, kg.[1]	1.39[a]	1.38[a]	1.38[a]	.91[b]
Daily D.M. intake, kg.	10.2	10.9	10.97	9.77
Adj. Efficiency, D.M. /adjusted gain, kg.	7.34	7.90	7.95	10.74

[1]Final weight, gain, daily gain, and efficiency were adjusted to the same carcass yield as the open heifers.

[a, b, c]Values with different subscripts differ significantly ($P < .05$).

than the abort-early heifers. This difference was probably due to the fetus, fetal membranes, and fluid associated with the pregnant heifers.

While cattle feeders sell live weight, packers sell carcass weight and dressing percent is the relationship between them. As Riley et al. (1983) emphasizes, trials are generally evaluated using liveweight gains, but liveweight can be influenced by feed and water intake, gut fill, and other waste factors. Rate of gain is also a criteria often used in live animal research, but liveweights necessary for its calculation may be affected by human error. However, carcass weights can be obtained with a much higher degree of accuracy. Therefore, dressing percent is a very useful tool when determining livestock performance. As previously explained, the final liveweights of each group were adjusted by using the dressing percent of the open heifer group.

After adjustment, no difference was shown between average daily gains of the open, pregnant, or early aborted heifers, yet the open heifers were 6.7 percent more efficient. Some slight set back, although unnoticeable, probably occurred in the basal metabolism of the abort-early group of heifers due to abortion and although nutrient requirements necessary for fetal development are minimal, a small amount of additional feed was necessary to reach similar heifer weights. Since the open heifers had less tax on growth, less feed was required to obtain the desirable ending weight; thus, better feed efficiency was evident. Carcass quality grade was virtually the same for the five management options.

ABORT-LATE GROUP:

The abort-late heifers were fed the growing diet until mid-gestation and then fed the same finishing diet for 77 days in an attempt to obtain the same slaughter weight as the open, pregnant, and abort-early management groups. Their rate of gain was significantly lower ($P < .05$) than the open, pregnant, and abort-early heifers on both an actual and adjusted basis (Table 4). In addition, feed efficiency was also lower. This decrease in performance indicates that the effect of abortion on heifer performance increases with stage of pregnancy. This data suggests that an abortifacient, if used, should be used early.

The entire feeding period of the abort-late heifers was separated into intervals (Table 5) in an attempt to determine what aspect of this management system reduced heifer performance. Contrary to expected conclusions, both 2-week intervals immediately following abortion exhibit the highest average daily gains as well as the best feed efficiency. Since these heifers were started on the higher energy level diet at abortion, after the long period on the limited energy diet, compensatory growth may be the major cause of this increased performance. Also, as Preston (1975) implies, estrogenic levels were expected to rise after abortion, but this influence was probably relatively slight. Basically, the compensatory gain simply outweighed the set back associated with abortion.

CALVE-OUT GROUP:

The calve-out heifers were fed the growing diet until 21 days post calving (210 days on feed) and then switched to the finishing

Table 5

EFFECT OF LATE ABORTION ON PERFORMANCE OF FEEDLOT HEIFERS

Period:	56 day Growing Pre-abort	14 day Post-abort	28 day Post-abort	77 day Post-abort
Number Head	23	23	23	23
Initial wt., kg.	357.9	390	390	390
Final wt., kg.	390	411.3	430.5	470
Gain, kg.	32.1	21.3	40.5	80
ADG, kg.	.57	1.52	1.45	1.04
Daily, D.M. intake, kg.	6.86	11.28	10.06	9.77
Efficiency, D.M./gain, kg.	12.03	7.42	6.94	9.39
Carcass Wt., kg.				279.56
Dressing Percent				59.5
USDA grade:				
No. Prime				0
No. Choice				22
No. Good				1
Adj. Final wt., kg.[1]				459.8
Adj. Gain, kg.[1]				69.8
Adj. ADG, kg./day[1]				.91
Daily, D.M. intake, kg.				9.77
Adj. Efficiency, D.M./ adjusted gain, kg.				10.74

[1]Final weight, gain, daily gain, and efficiency were adjusted to the same carcass yield as the open heifers.

diet to obtain a marketable finished product with a liveweight comparable to the other four groups of heifers. Performance of the calve-out heifers is summarized in Table 6. Overall, rate of gain and feed efficiency were markedly lower before and after carcass adjustment than any of the other four groups. This feeding program includes the last 2 months of the gestation period of the heifers. It was mentioned earlier that gestation requires very little nutrition for fetal development. This statement holds true for the first 7 months of gestation. However, the last 2 months before parturition 75 to 80 percent of fetal growth occurs and this fetal influence does require a much larger amount of nutrients from the dam's supply. Usually, the fetus gets the needed nutrients and the dam may go into a temporary deficit which results in decreased performance of the heifer.

Intervals of the feeding program of the calve-out group (Table 6) are used to further analyze their subnormal performance. Feed efficiency and rate of gain are less than desired during the growing phase. In the 6 week period termed the calving phase, a large loss of weight occurred, as expected, due to the weight loss of the fetus, fetal membranes, and fluids associated with parturition. Because of these losses, average daily gain and feed efficiency were negative. However, these negative values emphasize the fact that pre-calving heifer liveweights do not reflect the true performance of the heifer as an individual. In the post-calving stage, once again lower performance is shown in this management option than in any other management group. Although the calved heifers made some attempt to recover, the effort was not enough to overcome the trauma of calving and early lactation.

Table 6

EFFECT OF PARTURITION ON PERFORMANCE OF FEEDLOT HEIFERS

Period:	168 day Growing Pre-calving	42 day Calving	49 day Post-calving
Number Head	17	17	17
Initial wt., kg.	356.8	488.8	425.5
Final wt., kg.	488.8	425.5	467.6
Gain, kg.	132	-63.3	42.1
ADG, kg.	.79	-1.51	.86
Daily D.M./intake, kg.	9.05	5.58	9.69
Efficiency, D.M./gain, kg.	11.46		11.27
Carcass wt., kg.			276.3
Dressing Percent			59.1
USDA grade:			
No. Prime			0
No. Choice			15
No. Good			2
Adj. Final wt., kg.[1]			454.4
Adj. Gain, kg.[1]			28.9
Adj. ADG[1]			.59
Daily D.M. intake, kg.			9.69
Adj. Efficiency, D.M./ adjusted gain, kg.			16.42

[1]Final weight, gain, daily gain, and efficiency were adjusted to the same carcass yield as the open heifers.

Obviously, another product of the calve-out system was the calves. In this trial, five of the seventeen calves died (29%). Three deaths were because of dystocia and two calves failed to survive stress associated with a lack of facilities and unfavorable calving conditions.

Lower heifer performance and calving related problems tend to make this management system an unattractive option for feedlot operations.

ECONOMIC INFERENCES:

Table 7 illustrates theoretical profit comparisons between the five management options of feedlot heifers. This cost analysis indicates the pregnant heifers are the most profitable and the late aborted and calved heifers yield losses rather than profits. Just as the performance data indicate, the calve-out and abort-late groups are also inferior to the other treatment groups from an economic standpoint. Obviously, as pointed out in this trial, some calves will be lost during birth and others may be lost after parturition due to poor calving conditions. When calf mortality rate is subtracted from the total profit of a calved heifer, the profit can easily turn into a loss as there is obviously less marketable product to help overcome costs involved with calving heifers.

Another major problem with marketing heifers is that packer buyers may assume a certain pregnancy rate and discount the entire pen for the expected lower yield. This data (Table 4) indicates that a cattle feeder with a pen of open or early aborted heifers is justified in asking a premium price. If traditional marketing assumes a twenty percent pregnancy rate, then a premium of at least $.30/cwt liveweight

Table 7

AN ECONOMIC COMPARISON OF FIVE MANAGEMENT OPTIONS FOR FEEDLOT HEIFERS

Item/Heifer	Open	Pregnant	Abort-early	Abort-late	Calve-Out
EXPENSES:					
Purchased Heifer[1]	$483.17	$483.48	$489.80	$488.19	$488.52
Feed[2]	$ 94.40	$100.92	$101.51	$138.96	$158.09
Yardage[3]	$ 12.60	$ 12.60	$ 12.60	$ 24.15	$ 38.85
Labor[4]	------	------	------	------	$ 3.50
Interest[5]	$ 19.80	$ 19.93	$ 20.18	$ 39.90	$ 65.33
Abortifacient[6]	------	------	$ 5.50	$ 6.00	------
INCOME:					
Marketable Calf[7]	------	------	------	------	$ 42.60
Marketable Heifer[8]	$673.27	$692.64	$677.04	$672.17	$668.66
PROFIT (Loss)	$ 63.30	$ 75.71	$ 47.45	($ 25.03)	($ 43.03)

[1]Value of heifer at beginning trial weight, August 31, 1982, at $.62 per pound.

[2]Total feed costs were derived from actual diet ingredient costs during trial.

[3]Daily charge of $.15 per head.

[4]Labor cost was considered a constant for all groups with the exception of the Calve-Out management option which would require additional labor.

[5]Annual interest rate of 15% for cost of heifer and 50% of feed.

[6]Dosage was dependent of liveweight and was valued at $1.00 per cc.

[7]Calf was sold at one month of age and this value was adjusted to the 71% calf survival rate observed in this trial.

[8]Value of finished heifer when sold for $.65 per pound liveweight.

would be realistic. If the buyer does not discount for pregnant heifers, the superior performance of the pregnant heifers (Table 4) suggests that it would be advantageous to leave heifers pregnant rather than aborting them, provided they would be sold before visual signs of pregnancy were evident.

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THE EFFECT OF MANAGEMENT OPTION ON THE PERFORMANCE OF PREGNANT FEEDLOT HEIFERS

by

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ABSTRACT

Large commercial feedlots feed fewer heifers today than in the past primarily because of lower performance of heifers when compared to steers. Two main factors are responsible for this reduced performance. (1) The heifers placed in feedlots are generally smaller framed, less desirable, culled heifers from cow-calf operations and, (2) heifers are often pushed past proper endpoints of optimum performance in order to obtain liveweights desired by packer buyers. Nevertheless, heifers will probably remain a significant part of many cattle feeding operations. However, substantial numbers of heifers, especially those arriving during the fall, are pregnant when they are placed on feed and more information is needed to help select the most optimum management system.

In a trial using 105 Angus X Hereford heifers, the effect of five management options on performance of pregnant feedlot heifers was studied. Eighteen heifers were open, 23 were aborted at an average of 83 days pregnant (Abort-early), 24 were aborted at an average of 138 days pregnant (Abort-late), 23 were slaughtered at an average of 167 days pregnant (Pregnant), and 17 were allowed to calve before slaughter (Calve-out). The pregnant group of heifers was the fastest gaining and most efficient group, unless the slaughter weight was adjusted for the 1.7 percent lower carcass yield of the pregnant heifers. After slaughter weights for heifers in all management option groups were adjusted, using the carcass yield of the open heifers, no significant

differences ($P < .05$) existed among heifers in the open, abort-early, or pregnant groups. However, open heifers were 6.7 percent more efficient than pregnant heifers when slaughtered. Heifers in the abort-late and calve-out groups showed markedly lower gains and feed efficiency before and after slaughter weight adjustments.

Carcass quality did not differ among the five pregnancy management options.

When comparing profitability of the five pregnancy management options, heifers in the pregnant group were the most profitable and the abort-late, and the calve-out heifers actually showed losses. If death loss occurs in the calf crop, the calve-out option becomes the least economical.

The data indicate that because of increased carcass yield, packers can afford to pay a premium for open and early aborted heifers. However, if pregnant heifers (sold before visually pregnant) are not discounted and are sold on a liveweight basis, this option may be more profitable because of increased rate of gain and feed efficiency.