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LIMIT FEEDING PRODUCTION COWS IN CONFINEMENT

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Introduction

The available forage supply for maintaining beef cow herds continues to be threatened by several factors. High commodity prices encourage the conversion of pasture land into crop ground, cities and towns continue to sprawl out into rural areas creating subdivisions where historically cattle grazed, and drought, fires, hail, and insects continue to periodically deplete forage supplies. When forage supplies cannot be located or are not affordably priced; cattle producers must either sell their cattle or feed the cattle in confinement.

Feeding beef cows in confinement is not a new concept. However, limit feeding them (less than 2% of body weight on a DM basis) an energy dense diet, with the intent of keeping the cows in the production cycle, rather than finishing them out, needs to be thoroughly evaluated. Keeping cows in confinement 12 months out of the year may not be the most economical scenario, but partial confinement when pastures need deferment or forage is not available, may keep at least a core group of cows from being marketed, or provide a means of maintaining a cowherd where pastures is simply limited. Producers will need to know how and what to feed the cows while in confinement to make it feasible. Crop residues, poor quality hays such as those from the conservation reserve program (CRP), and by-products tend to be the most economical ingredients to include in confinement diets.

Nutrient Requirements of the Cow

When producers decide to limit feed cows in confinement there are three concepts that become key to successful feeding. The first concept to understand is the cow’s nutrient requirements. The cow’s nutrient requirements vary with age, size, and stage of production (NRC 1996). Two and three year old cows still have requirements for growth as well as gestation and/or lactation and should be fed separately from mature cows in a limit feeding situation to allow them to consume the feed needed to meet their requirements. More frequent sorting may be necessary when cows are limit fed to prevent very aggressive cows from over-consuming and timid cows from becoming too thin. When lactation starts, the cow’s nutrient needs increase and peak at about 8 weeks of lactation (Figure 1). Producers need to either increase the energy density of the diet or increase the pounds of dry matter fed when lactation starts.

Nutrient Content of the Feedstuffs

Another important consideration is the nutrient content of the commodities used in the limit fed ration. Most producers are familiar with feeding low to medium quality forages to mid-gestation cows. They typically supplement with a protein source to improve forage digestion and the cows are allowed ad libitum access to the forage. The protein allows the cow to adequately digest the forage and if the forage is not restricted, the cow can usually meet her energy requirements. Limit feeding cows while maintaining body condition requires a mindset shift for producers. While the protein needs of the cow do need to be met, the first limiting nutrient, especially for the lactating cow, is energy. Typically, producers are always encouraged to send feed samples to a commercial laboratory for testing. The TDN value listed on commercial laboratory results is not from an analysis but is actually calculated from acid detergent fiber (ADF). In the case of forages, this is fairly similar to the digestibility and is an acceptable measure of forage energy. However, due to the oil content of some by-products, and the interaction of by-products in residue based diets, the University of Nebraska recommends using TDN values for by-products based on animal performance in feeding trials (Table 1). Estimating too much energy for a commodity can result in poorer than expected cattle performance, while underestimating the energy value of a commodity would cause overfeeding, resulting in an increased expense for the confinement period.

Feed Intake of the Nursing Calf

The third important consideration is the feed intake of the calf. Nursing calves can be seen nibbling at forage within the first three weeks of life. By the time they are three months old, research indicates they are eating about 1% of BW in forage (Hollingsworth-Jenkins, et al. 1995). A 300 lb. calf would eat 3 lb. of DM in addition to nursing the cow. If calves are not weaned and in their own pen at this time, additional feed should be added to the bunk for them. Early weaning does not save feed energy but may be a good management practice in the confinement feeding situation. Research conducted at the University of Nebraska indicated that when nursing pairs were fed the same pounds of TDN as their weaned calf and dry cow counterparts, cow and calf performance was similar at the 205 d weaning date (Tables 2,3, and 4). Table 5 depicts the common diets fed to the pairs and their weaned calf and dry cow counterparts. While not resulting in an advantage in feed energy savings, early weaning can be advantageous in other ways. Early weaning would allow the calves to be placed in a separate pen from the cows. Producers would then have the flexibility of feeding the calves a growing or a finishing diet, or even allowing them to graze forages if available. The cows then, without the demands of lactation, could be placed on a lower energy diet.

Management Considerations for Young Calves in Confinement

A common misconception producers often have is that calves nursing cows do not need to drink very much water. In reality, they do need water, and especially so, when the temperatures are warm. A dairy calf study (Quigley, 2001) determined that calves less than 60 d old, consuming 0.8 gal/d of milk replacer, still consumed 0.66 gal/d of free choice water. These researchers also determined the relationship between temperature and free choice water intake was exponential rather than linear. At temperatures above 85° F, nursing calves may drink close to 1 gal/d of free choice water. Free choice water intake also promotes rumen development. Calves that begin eating early tend to thrive and gain weight better than those that don't. Young calves need to be able to reach the water tank and have access to sufficient water. In the UNL confinement feeding trial, calves as young as a couple of days drink water during July calving. Tanks need to be banked high enough that calves can reach the edge and water flow needs to be unrestricted enough that the tank can refill quickly after cows drink. The size of the tank needs to be big enough that on extremely hot days calves can access the water without cows pushing them away. In the research trial it was necessary to put small tubs of water out of reach of the cows but accessible to the calves. Feed access is also an issue as calves begin eating at a fairly young age. In the UNL confinement study, creep feeders were placed at the back of the feedlot pen to allow calves access to alfalfa pellets prior to 90 days of age. Although consumption was low (0.37% BW), it probably served to initiate some rumen function. Calves begin eating at the bunk with cows at an early age and therefore would need to be able to access the feed bunk as well.

Health Considerations for Calves in Confinement

As cattle in an intensively managed system have increased animal to animal contact, there are greater opportunities for pathogen transmission as compared to pasture systems. Neonatal calf diarrhea (scours) is the disease most likely to affect newborn calves during the first few weeks of life. Typically, the average dose-load of pathogen exposure is likely to increase throughout a calving season as calves that are infected initially serve as multipliers and are the foremost source of exposure to young susceptible calves. Consequently, calves born later during the calving season can receive greater dose-loads of pathogens and may also become more infective to other calves. The three primary strategies for preventing outbreaks of calf scours include: 1) removal of pathogens from the herd; 2) improve calf immunity against pathogens; and 3) adapt the production system to minimize opportunities for pathogen exposure and transmission. In the confinement cow study at the University of Nebraska, all pens were cleaned before calving. Then, pairs were grouped by calf age to prevent calves with more than a two week age difference from residing in the same pen.

Pneumonia (bovine respiratory disease or BRD) is also a prevalent source of calf losses early in life. Maternal immunity against infectious agents decreases with time, because by 90 to 120 days of age, a calf will retain less than 2% of the antibodies it initially absorbed from colostrum. The calf's immune system, although functional, is undeveloped in calves that are 90 to 120 days of age. Therefore, they may have increased susceptibility to respiratory disease. Management practices that provide opportunities for infection, such as weaning or commingling, may have a reduced influence on health if done before or after calves are 3 to 4 months of age. Developing sound vaccination protocols against respiratory disease in young (≤ 5 months) calves is important, and future research in this area is essential. Because of the increased opportunity for pathogen transmission, the likelihood of diseases such as scours, respiratory disease, and others occurring is greater for intensive than pasture systems. The importance of newborn calves nursing and receiving adequate colostrum immediately following birth cannot be overemphasized.

In the UNL system, the cow vaccination protocol consisted of two annual vaccinations. Cows were vaccinated with a killed virus product approximately 1 month prior to the start of calving to protect calves against scours. Pathogens vaccinated against included: bovine rotavirus, bovine coronavirus, E. Coli, and clostridium perfringes type C. At the same time, cows received a topical pour-on for the control of external parasites and either a pour-on or injectable solution against internal parasites. After calving and approximately 1 month prior to the start of the breeding season cows were vaccinated with a modified live virus product to protect against persistently infected calves and to prevent abortion. Pathogen strains included in this vaccine were: IBR, BVD types 1 & 2, PI3, BRSV, and multiple leptospirosis strains. At weaning, cows again received a topical pour-on for external parasites.

Calves were vaccinated initially at birth for blackleg, malignant edema, black disease, enterotoxemia, and haemophilus somnus. At birth, navels were sprayed with iodine and bull calves were band castrated. At approximately 90 days of age, calves again received the same vaccination that was given at birth and a modified live virus product to guard against IBR, BVD 1 & 2, PI3, and BRSV. After weaning at approximately 205 days of age, calves remained in the feedlot for growing and finishing, and received additional respiratory and clostridial vaccinations at that time. In both years of the study, at one location or the other, after weaning, some calves were treated for BRD. It is interesting to note that all calves treated responded well and no calves died from respiratory disease after weaning. Various factors contributed to the outbreaks such as weather, stress, and exposure to newly received cattle. These data suggest vaccination protocols for calves in intensively managed systems may need to be more aggressive than those for calves from extensive pasture systems.

Reproduction in Confinement

Cows can be successfully bred in confinement consuming a high energy limit-fed diet (Table 3). The overall conception rate of moderate BCS cows is higher if they are on an increasing plane of nutrition just prior and during the breeding season. This can be done by increasing the DM fed, or increasing the energy density of the diet. Additionally, confinement improves the ease with which synchronization and artificial insemination protocols can be implemented (http://beef.unl.edu/web/cattleproduction/breedingcowsinconfinement). When bulls are confined with cows allow an additional 2 feet of bunk space for every bull and another 15-18 lb of TDN per bull/d depending on the condition of the bulls during breeding.

Defining Confinement Feeding

Feeding in confinement does not necessarily have to be done in a feedlot setting. Although, the advantages of the feedlot often include feed trucks with scales and mixers, concrete bunks, good fences, and access to commodities not always available to ranchers. However, feeding cows in confinement can be achieved by setting up temporary feed bunks or feeding under a hot fence on harvested crop ground, pivot corners, a winter feed ground, or even, as a last resort, a sacrifice pasture. It is important to keep in mind that cattle limit fed a diet on a pasture will continue to consume the forage in the pasture and overgrazing can result if this is the option that has to be implemented. Regardless of location, cows will need a minimum of 2 ft. of bunk or feeding space and calves will need 1.5 ft.

Limit Fed Diet Options for Confined Cows or Pairs

Numerous commodities are acceptable in cow diets and their inclusion will depend on nutrient content, availability, and price. At least in Nebraska, there is large diversity in commodities available, particularly from the eastern to the western ends of the state. As a result, many diets have been formulated for producers. Some diets include ingredients unique to an area, while other ingredients are available in limited quantities in some areas and therefore cannot be included at very high levels. Purchase price and trucking costs also impact commodity inclusion. The following example diets were formulated by UNL extension specialists for research trials or Nebraska producers (Table 6). These diets have been used to maintain body condition on cows and can be adapted for other regions with the help of a nutritionist or extension personnel. Handling characteristics should be considered as well when determining what ingredients to use. Research has indicated a diet containing 80% ground cornstalks and 20% wet distillers grains will result in some sorting. Ground wheat straw or low quality hay may not result in the same degree of sorting. Corn wet distillers grains often results in less sorting than dry distillers. Unfortunately, many producers do not have access to the wet product. Mixing some water with the diet can reduce sorting or including silage or beet pulp can add enough moisture to reduce sorting. Rumensin can be added up to 200 mg/cow to improve efficiency and limestone should be added at 0.3 lb/cow to enhance the Ca:P ratio.

Conclusion

Limit feeding an energy dense diet to cows or pairs in confinement for a segment of the production cycle can be a viable alternative to herd liquidation. Producers choosing to limit feed cows or pairs in confinement must consider the nutrient needs of the cow, changes in nutrient requirements as production phase changes, nutrient content of available feeds, availability and associated costs of available feeds, as well as the increasing feed demands of the growing calf.

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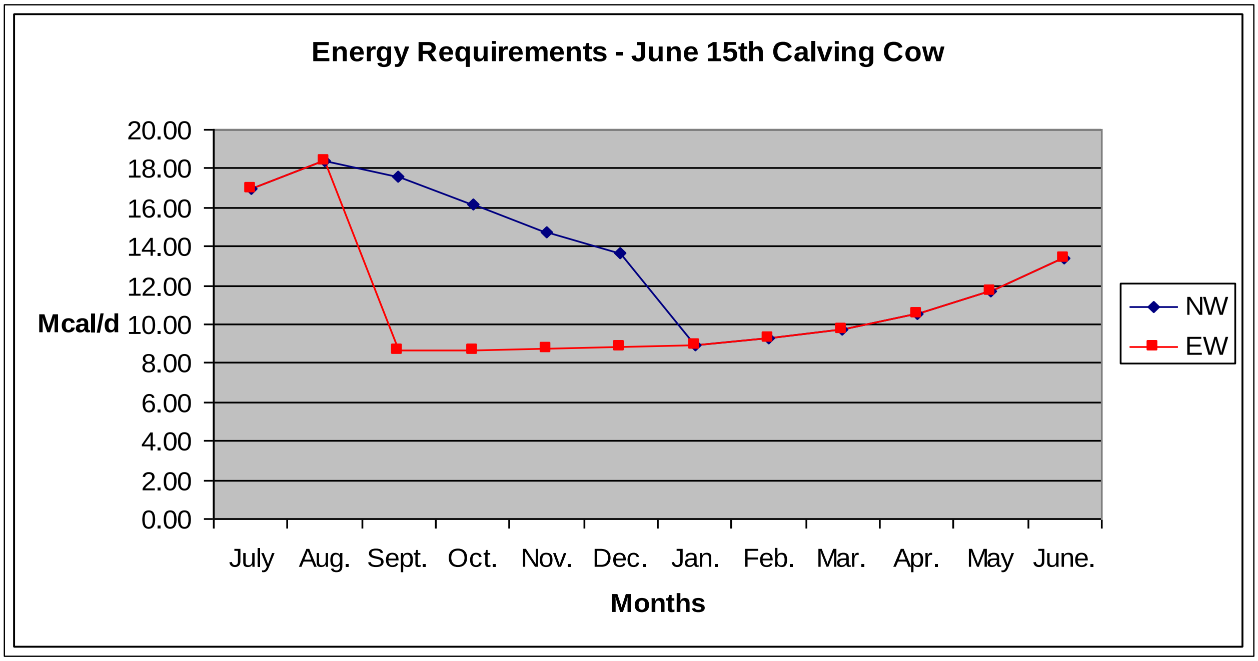

Figure 1. Energy requirement for gestating and lactating cows calving June 15, early weaned calves weaned at 90 days (EW) and normal weaned (NW) at a traditional 205 d weaning

Table 1. Total Digestible Nutrients of common by-products and commodities in forage based diets determined from feeding trials

Ingredient[1]	TDN (% dry matter)
Corn distillers grains, wet, dry, modified	108
Corn condensed solubles	108
Sugar beet pulp	90
Soyhulls	70
Synergy	105
Corn gluten feed	100
Midds	75
Corn	83
Wheat straw/cornstalks	43
Meadow Hay	57
[1] Feeding trials from Blasi et al., 1998; Ham et al., 1993; Klopfenstein and Owens, 1988; Loy et al., 2003; Nuttelman et al., 2009; Oliveros et al., 1987.	

Table 2. Daily DMI by weaning treatment and year

	Year 1		Year 2	
Item	EW[1]	NW[2]	EW[1]	NW[2]
Cow	15.0	--	15.5	--
Calf	8.5	--	9.3	--
Cow-calf Pair	--	22.8	--	24.9
Total	23.5	22.8	24.8	24.9

[1]EW = early-weaned at 91 d of age.
[2]NW = normal-weaned at 203 d of age.

Table 3. Performance of cows by location and weaning treatment

Item	ARDC		PREC		SEM	*P*-value		
	EW[4]	NW[5]	EW[4]	NW[5]		Weaning[1]	Location[2]	W x L[3]
Cow BW, lb								
October	1201	1180	1227	1212	114	0.26	0.08	0.85
January	1206	1166	1302	1232	104	0.02	<0.01	0.51
Cow BW change, lb	5	-14	74	20	23	<0.01	<0.01	0.15
Cow BCS[6]								
October	5.5	5.5	5.2	5.2	0.3	1.00	<0.01	0.59
January	5.4	5.3	5.6	5.6	0.4	0.60	0.03	0.60
Cow BCS change[6]	-0.1	-0.2	0.4	0.4	0.2	0.38	<0.01	0.38
Pregnancy, %	89.9	85.4	92.5	95.2	6	0.88	0.25	0.50

[1]Fixed effect of calf age at weaning.
[2]Fixed effect of location.
[3]Calf age at weaning x location interaction.
[4]EW = early-weaned at 91 d of age.
[5]NW = normal-weaned at 203 d of age.
[6]BCS on a 1 (emaciated) to 9 (obese) scale.

Table 4. Performance of calves by location and weaning treatment

	ARDC		PREC			*P*-value		
Item	EW[4]	NW[5]	EW[4]	NW[5]	SEM	Weaning[1]	Location[2]	W x L[3]
Calf BW[6], lb								
October	280	277	288	267	8	0.13	0.92	0.22
January	475[b,c]	510[a]	499[a,b]	461[c]	11	0.90	0.19	<0.01
Calf ADG, lb	1.73[b,c]	2.06[a]	1.86[b]	1.70[c]	0.18	0.09	0.02	<0.01

[1]Fixed effect of calf age at weaning.
[2]Fixed effect of location.
[3]Calf age at weaning x location interaction.
[4]EW = early-weaned at 91 d of age.
[5]NW = normal-weaned at 203 d of age.
[6]Actual weights.
[a-c]Within a row, least squares means without common superscripts differ at $P \leq 0.05$.

Table 5. Ingredient and nutrient composition of diets fed to all cows and calves from October to January by location and year[1]

	Year 1		Year 2	
Ingredient, %	ARDC	PREC	ARDC	PREC
Corn silage	--	--	40.0	40.0
MDGS	56.5	--	36.5	--
WDGS	--	58.0	--	38.0
Cornstalks	40.0	--	20.0	--
Wheat straw	--	40.0	--	20.0
Supplement[2]	3.5	2.0	3.5	2.0
Calculated Composition				
CP, %	19.0	18.8	16.1	15.3
TDN, %	80.0	80.0	78.0	78.4
Ca, %	0.75	0.77	0.58	0.81
P, %	0.50	0.49	0.44	0.41

[1]All values presented on a DM basis.

Table 6. Example Diets of by-products and residues for gestating, lactating, and lactating cows with 60 day old calves

Diet (DM ratio)	Ingredients	Late Gestation Cow	Lactating Cow	Cow with 60 d old calf
		Dry matter intake, lb		
57:43	Distillers grains:straw	15.0	18.0	20.0
30:70	Distillers grains:straw	19.2	23.0	25.6
40:20:40	Distillers grains:straw:silage	15.4	18.5	20.6
20:35:45	Distillers grains:straw:beet pulp	14.6	17.5	19.4

NOTES