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Management of Stocker Cattle on Small Grain Forage

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Objectives

- Discuss cattle supplementation
- Discuss frothy bloat in cattle and how to reduce its incidence
- Present three different strategies for providing energy supplements to growing cattle on wheat pasture

Winter wheat pasture is a unique and economically important renewable resource in Oklahoma and the southern Great Plains. Income is derived from both grain and the increased value that is added, as weight gain, to growing cattle that are grazed on wheat pasture. The potential for profit from grazing stocker cattle on wheat pasture is exceptionally good because of the high quality of the forage and the very favorable seasonality of prices for stocker and feeder cattle that favor price appreciation of the cattle.

Supplementation of cattle grazing wheat pasture is of interest to:

1. Provide a more balanced nutrient supply plus feed additives such as ionophores and bloat preventive compounds.
2. Substitute supplement for forage where it is desirable to increase stocking rate in relation to grazing management and/or marketing decisions.
3. Substitute supplements for forage under conditions of low forage standing crops.

It is said that risk decreases the value of cattle. Predicting performance of wheat pasture stocker cattle is particularly challenging because of potentially large variations in weather and forage standing crops. If weight gains of growing cattle cannot be predicted with some degree of accuracy, realistic breakevens, which are prerequisite to sound marketing decisions, cannot be calculated. The ability to predict cattle performance will become more important as the feedlot and stocker segments of the industry compete for supplies of stocker/feeder cattle, and as coordinated beef production systems come to fruition.

Mineral Content of Wheat Forage

Wheat pasture poisoning is a noninfectious metabolic disorder of cows grazed on wheat pasture. It occurs most frequently in mature cows that have been grazing wheat pasture for 60 days or more and are in the latter stages of pregnancy or are nursing calves. Cows with wheat pasture poisoning have low blood concentrations of both calcium and magnesium. While a similar tetany-like condition may occur in stocker cattle, its incidence is extremely low. Considerable variation occurs in the mineral composition of wheat forage. The data in Table 18.1 have been selected to indicate the calcium, phosphorus, magnesium, and potassium content of wheat forage in relation to the requirements for the same minerals of a 400-lb steer calf gaining 2 lbs per day.

Table 18.1 – Mineral composition of wheat forage.

Item	Calcium	Phosphorus	Magnesium	Potassium
Composition, % DM	0.35	0.25 - 0.40	0.15	3-5
Requirement[a]	0.55	0.26	0.10	0.6

a For a 496-lb, 10-month-old Charolais x Angus steer gaining 2.2 lbs/d and consuming 12.43 lbs of wheat forage dry matter.
Source: 1996 Beef Cattle NRC.

The values indicate that wheat forage contains marginal to sufficient phosphorus and magnesium, excess potassium that is characteristic of small grains forages in general, and inadequate amounts of calcium for growing cattle. Therefore, calcium is the macromineral of primary concern in many wheat pasture-grazing situations. In these situations, wheat pasture stockers should be supplemented with an additional 10 grams of calcium per day. While this may seem like a very small amount of calcium, and therefore perhaps not important, the total calcium requirement of a 400-lb steer calf gaining 2 lbs/day is 28 grams. The additional calcium could be included as calcium carbonate in other supplements or a mineral mixture. Mineral mixtures will not be effective if desired amounts are not consumed. Intake of mineral mixtures must be monitored.

The lower values for phosphorus content of wheat forage (Table 18.1) are from Bushland, Texas (Stewart et al.). In that area, and perhaps the Panhandle of Oklahoma and southwestern Kansas, wheat pasture stocker cattle should also receive supplemental phosphorus depending on soil type and actual mineral analysis of wheat forage. More recently a case of phosphorus deficiency was encountered in a group of growing steers grazing wheat pasture near Loyal, Oklahoma (north central Oklahoma). The farm had been in alfalfa for about six years prior to planting

All Web addresses given in this chapter are subject to change. The links to these Web sites will be updated regularly at the Master Cattleman Web site, http://agecon.okstate.edu/cattleman/manual_chapters.asp wheat. The application of phosphorus fertilizer for the wheat crop was less than recommended from soil test results. Phosphorus, calcium, magnesium, and potassium contents of wheat forage samples collected on January 14 were, respectively, 0.16%, 0.26%, 0.16%, and 1.72% of dry matter (DM). The Angus steers appeared healthy and were fairly fleshy, but seemed to crave bones, which were present in native grass adjacent to the wheat pasture from carcasses of cows that had died in previous years. Depraved appetite, or pica, is a classical sign of phosphorus deficiency in beef cattle. The mineral mixture that was being fed was changed from a low-phosphorus mineral (4.0%) to a mineral mixture that contained 12% calcium, 12% phosphorus, and 12% salt. The owner reported that this resolved the bone chewing problem.

The question relative to the effect of feeding mineral mixtures (often high-magnesium mineral mixtures) to wheat pasture stockers on the incidence of bloat is commonly raised. There is no evidence to support the suggestion that supplemental magnesium will decrease the incidence and/or severity of bloat in stocker cattle on wheat pasture. There may be a relationship between ruminal motility and the ability of stocker cattle to eructate ruminal gases and the calcium status of the cattle. Ruminal and gut motility is greatly compromised by subclinical deficiencies of calcium. Therefore, the concern of providing additional calcium to growing cattle on wheat pasture is two-fold: to meet requirements for growth and to perhaps decrease the bloat problem by an effect on ruminal motility. Of interest would be whether the so-called dry bloat problems that are sometimes observed in wheat pasture stocker cattle are related to a subclinical deficiency of calcium.

Frothy Bloat

Frothy bloat is a major cause of deaths in wheat pasture stocker cattle in Oklahoma. Death losses from wheat pasture bloat are believed to be about 2% annually, and sometimes are much higher on individual pastures. Bloat can strike suddenly and without warning. Some basic points relative to the causes and prevention of frothy bloat in wheat pasture stockers are:

1. Bloat occurs when the rate of eructation or removal of rumen fermentation gases is less than the rate of production; this may result from an increased rate of production of gases or from impaired function of the rumen, cardia, or esophagus.
2. Rumen fermentation gases may become entrapped in ruminal fluid froth or foam and cannot be eructated regardless of the functionality of the rumen and/or other digestive organs.
3. The chemical composition of wheat forage changes depending upon environmental growing conditions, the stage of wheat plant growth or maturity and fertility level; therefore, it affects the likelihood that stable ruminal foam will be formed when wheat forage is grazed.

Factors Contributing to Wheat Pasture Bloat

Some of the factors involved in the occurrence of frothy bloat of wheat pasture stocker cattle include:

1. Wheat forage intakes, on an as-grazed basis, are very high in order to support the high rates of weight gain commonly observed for wheat pasture stocker cattle. We have commonly measured forage intakes (dry matter basis) of 2.8% to 3% of body weight of steers grazed on wheat pasture (i.e., 44.8 lbs to 48 lbs of forage containing 25% dry matter for a 400-lb steer). These high forage intakes and the fact that wheat forage ferments (digests) very rapidly in the rumen are conducive to the production of extremely large volumes of rumen fermentation gases which, if not eructated normally, can lead to bloat.
2. Wheat forage is high in crude protein with reported values of 18% to 34% of forage dry matter. A possible relationship exists between the incidence of bloat in stocker cattle and the crude protein content of wheat forage. The protein content of wheat forage is influenced by plant growth stage and level of nitrogen fertilization. Results of analyses of wheat forage samples collected many years ago from pastures in Oklahoma where bloat did or did not occur are shown in Table 18.2. Forage samples from bloat-provocative pastures contained less dry matter and total fiber (neutral-detergent fiber (NDF)). The concentration of crude protein and soluble nitrogen fractions in forage samples from bloat-provocative pastures were all significantly higher.

Table 18.2 – Chemical composition of wheat forage where bloat was not observed and bloat provocative pastures.

Wheat Pasture	No Bloat	Bloat (2%-5% Death Loss)
Number of samples	9	7
Dry matter (DM), %	28.48	22.31
Neutral-detergent fiber	44.59	35.02[a]
Crude protein, % DM	25.40	31.75[a]
Soluble nitrogen, % DM	1.85	3.24[a]

a (P<.05).
Source: Horn et al., 1977.

The extent to which the analyses in Table 18.2 reflect stage of wheat forage growth or age of accumulated forage growth (maturity) is not known. The data do suggest, however, that a subtle relationship exist between climatic growing conditions, soil fertility management, and stocking rates as they affect wheat forage maturity and the incidence of bloat (Figure 18.1).

Wheat forage of several days accumulated growth may be more fibrous and less succulent than wheat forage of only a few days growth. Stockers grazing the more fibrous, less succulent wheat forage may secrete greater quantities of saliva during the chewing associated with eating and during rechewing of regurgitated boluses. The increased amounts of saliva

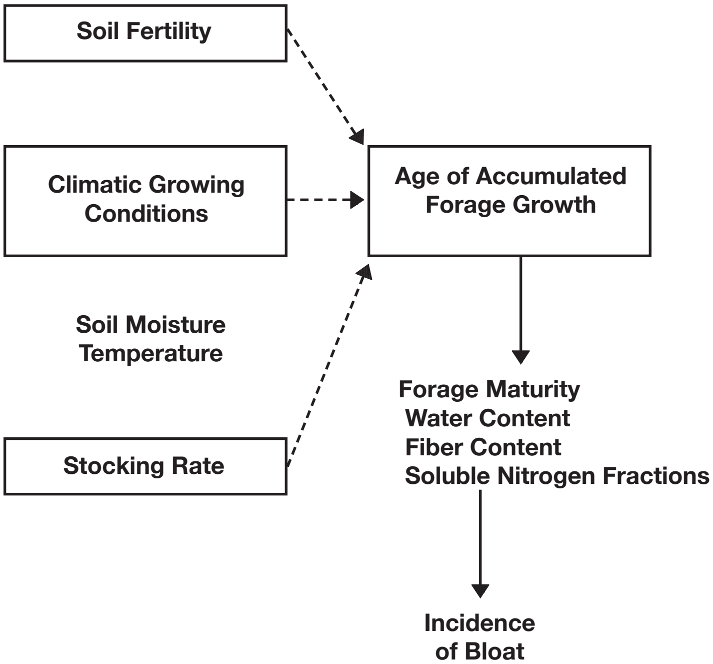

Figure 18.1 – Some variables affecting forage maturity and possibly the incidence of bloat in wheat pasture stockers.

may have an anti-foaming effect and thus reduce the incidence of frothy bloat. The significantly decreased total fiber content (neutral-detergent fiber, Table 18.2) supports this rationale. In general, one would expect higher incidences of bloat during periods of rapid forage growth and in small forage standing crops. These periods often occur during fall and mid-winter grazing periods around Feb. 4 as day length increases and active plant growth begins. Frosts tend to increase fragility of leaf surfaces, increase rate of fermentation of the soluble carbohydrate fractions of forage, and thereby, along with changes in grazing behavior of cattle, increase bloat. From a practical standpoint, wheat pasture stockers that are frequently seen chewing their cuds may be less likely to bloat than those that are not. Also freeze-burned (brown to whitish), dormant wheat forage is not likely to cause bloat.

Another contributing factor to the bloating of stockers on wheat pasture is the marked changes in grazing behavior that occurs in stocker cattle in response to the movement of weather fronts through the southern Great Plains. Horn et al. (1976) reported that there is a period of little or no grazing prior to weather fronts, and the front is followed by a period of very active grazing. This change in rate of intake of highly fermentable forage is conducive to bloat.

Management Practices to Reduce the Incidence of Bloat

Producers should separate animals with predisposition of bloat. There are commonly marked differences among animals within herds with regard to their predisposition or susceptibility to bloat. Where physical facilities and labor management permits, animals that are identified as having a predisposition to bloat should be managed differently in order to minimize the chances of bloat.

Another way to control bloat is to feed poloxalene. The feed additive poloxalene was developed in the early 1960s (Bartley and Bassette, 1961) and markedly decreases the incidence and severity of both alfalfa and wheat pasture bloat of cattle. In the event of a bloat outbreak, poloxalene is the product of choice to administer to cattle at a dosage of 1 gram to 2 grams per 100 lbs of body weight per day. Poloxalene is a surfactant that reduces the surface tension of foam, and it decreases foam formation in the rumen and entrapment of fermentation gases. There are several poloxalene containing products available for use in grazing programs, including feed additives, top dresses, mineral supplements, blocks, and liquid feeds. It is important to remember that to be effective, adequate amounts of poloxalene must be consumed on a daily basis. Since bloat outbreaks can occur very quickly, producers may want to consider having a small emergency supply of poloxalene-containing supplement on hand throughout the bloat season. Guaranteed consumption of a sufficient amount of poloxalene may require hand feeding a palatable supplemental feed containing poloxalene each day. Because of cost, it is generally not economical to feed poloxalene continuously throughout the wheat pasture-grazing period. Producers need to evaluate each pasture for history of bloat, the number of cattle bloating, and the severity of the bloat in making the decision to feed poloxalene-containing products. Spreadsheet programs such as the OSU STOCKER PLANNER are excellent tools for evaluating decisions relative to feeding poloxalene-containing products. Breakeven death loss percentages can be easily calculated for different scenarios, daily cost of product, and days of feeding poloxalene.

Feeding monensin can also help reduce bloat. Although monensin (Rumensin®) is not a true bloat-preventive compound like poloxalene, studies have shown that it does decrease the incidence and severity of wheat pasture bloat. The Oklahoma Green Gold supplement is a monensin-containing energy supplement designed to be hand fed daily at the rate of 2 lbs/animal or every other day at the rate of 4 lbs/animal. The rationale in support of this supplementation program, its effect on cattle performance, and potential effects on bloat are discussed later in this chapter. The strategy of using this supplementation program would be to feed it throughout the wheat pasture grazing period and to substitute poloxalene for monensin during times of bloat outbreaks. With this approach, cattle are accustomed to going to a feeder and the increased weight gain from the Oklahoma Green Gold program will improve the economics of the total supplementation program.

Mineral supplements were discussed earlier in this chapter. The additional calcium is needed to meet the requirements of calcium for growth and perhaps to prevent a subclinical deficiency of calcium, which could compromise ruminal motility and contribute to bloat. For many years it has been recommended that wheat pasture stocker cattle be given free-choice access to a high-calcium mineral mixture. The one typically used contains 16% calcium, 4% phosphorus, 5.5% magnesium, and about 20% salt. In a two-year study that used a negative control (that is cattle that grazed wheat pasture and received no mineral or any other supplement), the mineral supplement increased weight gain in only one year by 0.26 lb/day. However, from a management standpoint, feeding the mineral supplement provided a means of getting poloxalene into the cattle when bloat was a problem. Hand mixing of Bloat Guard® Medicated Premix (52% poloxalene) into the mineral mixture (25% Bloat Guard® and 75% mineral mixture) resulted in good, efficacious intakes of poloxalene for bloat prevention.

The question relative to the effect of feeding high-magnesium mineral mixtures on the incidence of bloat is commonly raised. There is no data to support the suggestion that supplemental magnesium will decrease bloat of wheat pasture stocker cattle.

Feeding Low-quality Roughages to Wheat Pasture Stocker Cattle

Low-quality roughages such as wheat straw are commonly fed free choice to stocker cattle on wheat pasture. The most common reasons cited by producers for feeding low-quality roughages on wheat pasture include the following:

- To provide a means of slowing rate of passage and thereby increase the utilization of washy wheat forage
- To reduce the incidence of bloat

A very important question relative to feeding low-quality roughages to wheat pasture stockers is what effect they may have on wheat forage intake and stocker weight gains. Intakes of 2 lbs to 3 lbs of straw dry matter per day, if substituted for wheat forage, could decrease weight gains of stockers by as much as 0.46 lb/day (2.11 lbs versus 1.65 lbs) as indicated in Table 18.3. These gains were estimated by calculating the effect of substituting wheat straw for wheat forage, taking into account the much lower energy value of wheat straw.

Table 18.3 – Effect of straw consumption on calculated daily weight gains of wheat pasture stockers[a].

Item	All wheat forage	Wheat forage +2 lbs straw	Wheat forage +3 lbs straw
Daily gains, lbs	2.11	1.80	1.65
Change from all wheat forage, lb/day	–	-0.31	-0.46

a Calculated for a 440-lb steer with a total dry matter intake (wheat forage alone or wheat forage plus straw) of 3% of body weight.
Source: Mader et al., 1983 and Mader and Horn, 1986.

Several years ago a three-year study was conducted in which fall-weaned steer calves (initial mean weight of 378 lbs) grazed clean-tilled wheat pasture (Nov. 23 to March 24, plus or minus 3 to 7 days) and were fed no supplemental feed or had free-choice access to wheat straw (WS) or sorghum-sudan hay (SS) (Mader et al., 1983 and Mader and Horn, 1986). Results were as follows:

- Daily consumption of low-quality roughage was low and ranged from:
  - WS 0.15 lb to 0.4 lb/hd/day
  - SS 0.35 lb to 0.9 lb/hd/day
- Live and carcass weight gains of steers were not affected by offering low-quality roughage.
- Feeding steers two times the amount of low quality roughage as listed in the first bullet above did not affect intake, digestibility, or rate of passage of wheat forage.
- Bloat was observed only during the last 2 weeks of the period of lush spring growth of wheat forage of the first year; the incidence and severity of bloat of the control, wheat straw, and sorghum-sudan fed steers were not different among treatments; intake of wheat straw and sorghum-sudan hay was only about 5% to 12% of roughage intakes reported in the literature to effectively control or aid the prevention of bloat; therefore, it seems unlikely that low-quality roughage consumed in amounts similar to those of this study will control bloat of stocker cattle on wheat pasture.

Significant positive or negative responses to feeding low-quality roughage to stocker cattle on wheat pasture have not been seen. It appears to be a practice of little consequence. However, if cattle on wheat pasture do not have a dry place to lie down, availability of low-quality roughages may improve performance by providing bedding and aiding maintenance of normal body temperature during severe storms.

Energy Supplementation

Feeding moderate amounts of energy supplement to growing cattle on wheat pasture increases the stability of the enterprise and improves the predictability of cattle performance, which decreases production risk. It also increases stocking rate and flexibility by having more cattle on hand during fall/winter grazing for subsequent grazing during the graze-out period if desirable. Because of the seasonality of stocker/feeder cattle prices and the dynamics of breakeven selling prices in stocker cattle budgets, the latter of these can be particularly important to the economics of growing cattle on wheat pasture.

Silage

There are areas of the southern Great Plains where silage is used very successfully to stretch available wheat forage and allow initial stocking densities on wheat pasture to be increased. In studies reported by Vogel et al. (1987 and 1989), use of supplemental silage allowed initial stocking density on wheat pasture to be doubled without decreasing weight gains of stocker cattle. Supplemental silage decreased wheat forage intake linearly (P<.10). Each pound of added silage DM decreased DM intake of wheat forage by 0.66 lb. Extent of ruminal digestion of DM and NDF of wheat forage was increased by feeding silage indicating that silage had a positive associative effect on utilization of wheat forage (Vogel et al., 1989).

High-starch Versus High-fiber Byproduct Feed Based Energy Supplements

The response of growing cattle on wheat and other small grain pastures to supplemental grain has been variable. To prevent potentially adverse effects of starch on ruminal fermentation, high-fiber byproduct feeds offer alternatives in formulating energy supplements with fairly high energy densities. Examples include wheat middlings, soybean hulls, and corn gluten feed. The potential for using these byproduct feeds in supplementing growing cattle on wheat pasture is particularly good because of the rapid rate of ruminal degradation of wheat forage and the resultant relatively low ruminal pH.

During the early years of research at the Wheat Pasture Research Unit near Marshall, Oklahoma, studies were conducted to evaluate types of energy supplements for growing cattle on wheat pasture. A corn-based, high-starch supplement was compared to a high-fiber byproduct feed-based energy supplement. The high-fiber energy supplement contained about 47% soybean hulls and 42% wheat middlings (as-fed basis), and all supplements contained 40 mg/lb of monensin. The supplements were hand fed six days/week at a level of about 0.75% of body weight (i.e., 4 lbs/day for a 533-lb steer) and stocking rate was increased 22% to 44%. Nonsupplemented, control cattle had free-choice access to a high-calcium (16%) commercial mineral mixture throughout the study. Details of the studies have been reported by Horn et al. (1995). In general, results were as follows:

Supplementation Response. Over the three-year period, weight gains during the fall/winter- and early- spring grazing period (up to time of first hollow stem stage of maturity of wheat) were increased by energy supplementation (regardless of type of energy supplement) by an average of 0.33 lb/day. Weight gains were 2.02 lbs, 2.33 lbs, and 2.38 lbs/day for the control, high-starch, and high-fiber supplemented steers, respectively. The gain response was similar at all stocking rates. Mean consumption of the supplements was 0.65% of body weight, which was a little less than the target of 0.75%.

Type of Energy Supplement. Type of energy supplement (high-starch versus high-fiber) did not affect weight gains of the cattle. The difference in response by cattle to high-fiber versus high-starch energy supplements is expected to decrease as the amount of supplement fed decreases and as crude protein content of the forage increases. The level of supplement fed in these studies was relatively small and wheat forage contains excess crude protein. Substitution of supplement for wheat forage did not differ for the two types of supplements. Wheat forage intake was decreased by 0.91 lb. for every pound of supplement consumed (Cravey, 1993).

Supplement Conversion. Mean conversion of the supplements (expressed as pounds of as-fed supplement per pounds of increased gain per acre) was about 5 for both types of supplement. This is substantially less than conversions of 9 to 10 that have traditionally been used in evaluating the economics of energy supplementation programs for wheat pasture stocker cattle.

Cattle Preference for Supplements. Cattle seemed to like the high-fiber supplement and consumed it much more readily than the corn-based high-starch supplement. Generally, the cattle consumed the high-fiber supplement in a matter of 10 to 30 minutes in the morning. In contrast, the corn-based supplement was eaten over at least two feeding periods during the day (morning and midafternoon). From a feed and bunk management standpoint, this difference in the supplements is extremely important on days of inclement weather (rain, snow, etc.) and in situations of bird predation. Contamination of feed bunks by bird excreta was substantial for the corn-based supplement. In addition, the potential for acidosis is much less for the high-fiber supplement provided that the wheat middlings used in the high-fiber supplement do not contain a lot of fine starch.

Feedlot Performance. Because wheat pasture cattle are some of the more fleshy cattle that are placed on feed, the potential effect of energy supplementation on subsequent feedlot performance is of interest. Cattle were followed through the feedlot in two of the three years. Supplementation did not affect feed intake or feed gain in year one, but average daily gain was decreased by about 0.20 lb (P<0.05). In another year, daily gain of the cattle in the feedlot was not affected by two supplementations on wheat pasture.

Economic Analysis

There are several levels of economic analyses that can be used in evaluating supplementation programs and other management decisions in stocker cattle programs.

One approach is to simply compare cost of the additional weight gain to the gross value of weight gain in the stocker program. From the data reported by Trapp (1998) for Oklahoma City National Stockyards, price ($/cwt) was fit to sale weight for stocker/feeder steers and heifers over two periods of time (1988 through

Table 18.4 – Prices relating to weight.

Steers, 1988 -1997	Price ($/cwt) = 150.11 - .1579x + .00008x2
Steers, 1992 - 1997	Price ($/cwt) = 132.03 - .1286x + .00007x2
Heifers, 1988 - 1997	Price ($/cwt) = 120.78 - .1166x + .00007x2
Heifers, 1992 - 1997	Price ($/cwt) = 104.65 - .0902x + .00006x2

Source: Trapp, 1998.

Table 18.5 – Value of weight gain, $/cwt.

Wt. Range, lbs	1988-1997 (10 years)		1993 -1997 (5 years)	
	Steers	Heifers	Steers	Heifers
350 - 550	–	$73.01	–	$70.67
450 - 650	$60.61	$66.27	$60.72	$64.38
450 - 750	$54.77	–	$53.45	–

Source: Trapp, 1998.

1997, 10 years; and 1992 through 1997, 5 years). Prices were related to weight (x) as shown in Table 18.4.

If one then adjusts the prices for seasonality, value of weight gain for purchasing calves in October and selling feeders in March are shown in Table 18.5. The value of weight gain for growing steers on wheat pasture from 450 lbs to 650 lbs or from 450 lbs to 750 lbs ranged from about $54 to $61/cwt. Values for adding 200 lbs to 350- or 450-weight heifers are substantially higher. With present cattle price structures, these values of weight gain are much too low. Values of weight gain may be as high as $112-115/cwt for wheat pasture cattle this coming year (2008-09).

If the cost of the additional weight gain from supplementation is less than the value of weight gain, supplementation will be profitable. At a supplement conversion of 5 lbs supplement per pound of increased gain per acre and a feed cost of $270/ton, supplement cost per pound of increased gain would be $0.68. Remember this is valid only if stocking rate is increased since supplement conversion is expressed on an increased gain per acre basis. Also, any additional costs incurred in feeding the supplement (e.g., fuel, labor, etc.) should be included in the evaluation.

Spreadsheet programs such as the OSU STOCKER PLANNER are excellent tools for evaluating a myriad of questions, management decisions, etc. in a stocker cattle program. Copies can be downloaded from the Web site http://www.ansi.okstate.edu/software/. Pasture can be priced on a cost of gain basis or as $/cwt of cattle/month. In addition, the pasture cost can be modified to represent actual pasture cost ($/hd).

Development of the Oklahoma Green Gold Supplementation Program

Two ionophores, monensin and lasalocid, are available for wheat pasture stocker cattle. Both of them, if delivered in the proper dosage, increase weight gains of growing cattle on wheat pasture by 0.18 lb to 0.24 lb/day over that of the carrier supplement, and improve the economics of supplementation programs. In addition, producer experience and research indicate that monensin decreases the incidence and severity of bloat from wheat pasture (Branine and Galyean 1990). Other characteristics of the two ionophores are listed in Table 18.6. The plus sign indicates a more favorable or greater response of one over the other.

While some producers prefer self-limiting supplements that can be fed free-choice, others prefer to hand-feed supplements. Hand-feeding obviously allows much better control of supplement intake, and monensin has FDA approval for every-other-day feeding to stocker cattle.

The Oklahoma Green Gold supplement is a monensin-containing energy supplement for growing cattle on wheat pasture. It is designed to be hand-fed daily at the rate of 2 lbs/animal or every other day at the rate of 4 lbs/animal. The supplement contents are shown in Table 18.7.

Table 18.6 – Characteristics of ionophores.

	Monensin	Lasalocid
Weight Gain Response	Equal if proper dosage of ionophore achieved	
Bloat protection	+	
Palatability		+
Potential for toxicity	+	
FDA clearance for every-other-day feeding	+	

Table 18.7 – Contents of the Oklahoma Green Gold supplement.

Ingredient	1992/93[a]	1997/98[b]
Ground milo	66.65	62.15
Wheat middlings	21.00	21.00
Sugarcane molasses	4.80	5.00
Limestone	4.00	4.30
Dicalcium phosphate, 21% P	2.55	2.55
Magnesium mica (Smectite)		4.00
Fine mixing salt[c]	0.50	0.50
Magnesium oxide	0.35	0.22
Rumensin® 60 premix	0.15[d]	
Rumensin® 80 premix		0.125[e]
Vitamin and trace-mineral premix		0.10
Vitamin A-30		0.05

a Source: Andrae et al., 1994.
b Source: Paisley et al., 1998.
c Fine mixing salt (99.5% NaCl).
d To provide 90 mg monensin/lb of supplement.
e To provide 100 mg monensin/lb of supplement.

Some questions/answers relative to the rationale and use of this supplementation program for wheat pasture stocker cattle are as follows:

1. **What are the potential benefits of the Oklahoma Green Gold supplementation program?**
   This supplement will:
   - Provide additional digestible energy and help balance the energy to crude protein ratio of wheat forage
   - Provide monensin to improve the economics of the supplementation program and decrease the incidence and severity of bloat
   - Provide additional calcium for growth of stocker cattle
   - Provide a means from a management standpoint of getting other feed additives into the cattle when needed, for instance, Bloat Guard® (poloxalene) in cases of severe or protracted bloat outbreaks

   A summary of five trials conducted over three years showing the effect of the supplementation program of live weight gain of stocker cattle grazing wheat pasture is shown in Table 18.8. In four of the five trials, the mean (± std. dev.) response to the hand-fed supplement (excluding the negative gain from Marshall in 1998-1999, which was considered an outlier) was:
   Daily gain: +0.42 ± .10
   Supplement conversion: 4.72 ± .50.

2. **What is the data relative to the effect of this supplementation program on bloat?**
   Because the incidence of bloat was not large enough during the five trials listed above, there is no data relative to this question. However, Branine and Galyean reported that monensin decreased the incidence and severity of bloat from wheat pasture. In a study reported by Paisley and Horn, 12 rumen cannulated steers that grazed the same wheat pasture near Stillwater were randomly allotted to three experimental groups. Gelatin capsules containing nothing, monensin, or lasalocid were placed directly into the rumen of each steer each day. Dosage of the ionophores was 300 mg/day because the steers weighed 1,164 ± 67 lbs. After a preliminary period of 16 days, the steers were assigned a bloat score each morning from March 15 through March 28 (14 days). While the wheat was in a rapid growth stage during this time, it was fairly immature. Hard freezes on the mornings of March 14, 15, and 16 increased the incidence of bloat and slowed the rate of wheat growth. Monensin decreased ($P<.05$) both the incidence and severity of bloat and was more efficacious for prevention of bloat than lasalocid. In addition to increasing rate of weight gain, the Oklahoma Green Gold supplementation program should decrease bloat.

3. **Can stocking rate be increased with this supplementation program?**
   No, the rate of feeding the supplement is not high enough to allow stocking rate to be increased above normal stocking rates for the area in which it is fed.

4. **What are the supplement specifications?**
   Sources of Energy. About 82% to 90% of the as-fed formula should consist of corn, milo, wheat middlings, and/or soybean hulls as the source(s) of energy. Corn gluten feed should not be used because of concerns that the additional sulfur may accentuate the incidence of polioencelphalomalacia that sometimes occurs in wheat pasture stocker cattle. No roughage products other than soybean hulls should be included in the supplement.
   Form. It is recommended that the supplement be manufactured as a small pellet because intake data was obtained with pelleted supplements. Pellets also decrease the potential for segregation of ingredients.
   Mineral content. The supplement should contain 2.25% to 2.75% calcium, 1% phosphorus, 0.7% magnesium, 60 ppm copper, and 0.75% to 1.25% salt for the as-fed formula. No additional iron or potassium should be added to the supplement.

Table 18.8 – Summary of effect of monensin-containing energy supplement (hand fed every other day) on weight gain and supplement conversion by wheat pasture stocker cattle.

Year/location	Daily gain, lbs		Gain response	Mean supplement intake, lbs/hd/day	Supplement conversion[d]
	Control	Supplement			
1992-1993					
Stillwater	2.31	2.87[a]	+.56	1.55[b]	4.16
1997-1998					
Stillwater	2.56	2.94[a]	+.38	1.74[c]	4.55
Marshall	2.50	2.90[a]	+.40	1.92[c]	4.80
1998-1999					
Stillwater	2.56	2.90[a]	+.34	1.82[c]	5.35
Marshall	2.55	2.53	-.02	1.78[c]	–

a Different from control ($P<.05$).
b Contained 90 mg monensin/lb as-fed.
c Contained 100 mg monensin/lb as-fed.
d Pounds of as-fed supplement per lb of increased weight gain.
Source: Andrae et al., 1994 and Paisley et al., 1998.

Vitamin content. The supplement should contain a minimum of 10,000 IU of added vitamin A.

Monensin concentration. The as-fed supplement should contain 90 mg to 100 mg of monensin/lb.

5. **Are there any precautions in using this supplement?**

Yes, this supplementation program does require close management. Monensin in large amounts will kill cattle. However, if one considers the lethal dose, 1%, for monensin to be 5.5 mg/kg body weight or 1,250 mg/hd/day for a 500-lb steer, then there is a theoretical safety ratio of 6.25 for 500-lb cattle consuming 200 mg monensin/day. Feeding the supplement every other day may increase the likelihood that some cattle could eat more than the desired amount of supplement. The primary challenge in using this supplementation program is one of having good management and enough time to be a good observer of what the cattle are doing. While this supplementation program worked well, the studies were with small numbers of cattle on pastures of 18 to 24 acres in size. Feed bunk space was adequate for all cattle to eat the supplement during a single feeding bout. Producers have to be good observers of cattle feeding behavior in relation to location of feed bunks in the pasture. Care has to be taken that there is adequate bunk space so that some cattle do not over-consume the supplement.

Also, horses and other equines should not be allowed access to this supplement. Ingestion of monensin by equines has been fatal.

Energy Supplements to Stretch a Shortage of Wheat Pasture

The 1991-1992 wheat pasture year was very dry, and many pastures were extremely short of forage at the time of traditional turnout. In some pastures, there was as little as 300 lbs of forage dry matter per acre. While this was a problem, it did present an opportunity to compare some different types of energy supplements for stretching this severe shortage of wheat pasture. The objective was to compare limited amounts (1% of mean body weight) of whole corn, dry-rolled corn, or a 50/50 mix of pelleted wheat middlings/soybean hulls. The supplements were hand-fed six days a week. The target gain for the cattle was 2 lbs/day. Nine pastures were used in the study and initial stocking density was 3.5 acres/steer to provide an initial forage allowance of 1,050 lbs of forage DM/steer. Because of the very mild winter and continued growth of wheat forage, cattle in three pastures were distributed by treatment through the other six pastures on Jan. 30, 1992, in an attempt to provide equal or lesser amounts of forage to all cattle. Forage availability in each of the pastures on Jan. 21 was about 1,500 lbs DM/steer and greater than was preferred for the initial objective of the trial. Forage growth after Jan. 30 was excellent. Because wheat jointed so early, the cattle were removed on Feb. 28. Performance of the steers is shown in Table 18.9.

Table 18.9 – Energy supplements for stretching wheat pasture.

	Whole corn	Dry-rolled corn	Wheat middlings/ soybean hulls
No. pastures	2	2	2
No. steers	10[a]	12	12[b]
Initial weight, lbs (12/5/91)	438	438	439
Final weight, lbs (2/28/92)	622	630	625
Daily gain, lbs[c] (84 days)	2.17	2.25	2.19

a Increased to 14 on Jan. 30.
b Increased to 18 on Jan. 30.
c Add-on steers of Jan. 30 were not included in calculation of mean daily gains. Differences among treatments are not significant (P>.62).
Source: Horn and Paisley, 1999.

Weight gain of all steers was about 2.2 lbs/day during the 84-day trial and was not different (P>.62) among treatments, which is in general agreement with other results. No difference in gain was observed between steers supplemented with a high-starch, corn-based supplement versus a high-fiber, byproduct feed-based supplement on wheat pasture. Steers consumed the whole corn much more readily than the rolled corn and usually had slick bunks by midafternoon. Two steers on rolled corn foundered and showed signs of lameness throughout most of the trial. Because of the small numbers of pastures and steers in this trial, this data should be considered only preliminary. However, from a feed and bunk management standpoint, the whole corn was clearly more desirable than the rolled corn.

The 1995-1996 wheat pasture year presented another opportunity to evaluate a limit feeding program with whole shelled corn for steers on wheat pasture. Three pastures with 10 to 13 steers/pasture were used. Wheat forage standing crops on Dec. 7 (date of turnout), Jan. 17, and March 12 were 511 lbs, 376 lbs, and 251 lbs DM/acre, respectively. Forage allowances on these same dates were 1,024, 749, and 725 lbs DM/steer. Steers had free-choice access to a high-calcium (16%) mineral mixture. While the target level of intake of whole corn was 1% of body weight, the cattle did not achieve this level of intake until about Jan. 17, or day 41. Corn intake was very consistent among pastures and averaged 0.75% of body weight from Dec. 7 to March 15 (98 days). Mean weight of the steers at the start of the trial was 540 lbs, and they gained 1.86 ± 0.11 (std. dev.) lbs/day.

Conclusion

Supplementation of cattle grazing wheat pasture is of interest in order to:

- Provide a more balanced nutrient supply and feed additives such as ionophores and bloat preventive compounds
- Substitute supplement for forage where it is desirable to increase stocking rate in relation to

grazing management and/or marketing decisions
- Substitute supplement for forage under conditions of low forage standing crops

Three different strategies for providing energy supplements to growing cattle on wheat pasture were presented. One strategy was to develop a hand-fed small package (that is, target intake of 2 lbs/day or 4 lbs every other day) monensin-containing energy supplement to provide a more balanced dry organic matter to crude protein ratio in the total diet. This supplementation program (Oklahoma Green Gold) consistently increased daily gain by 0.42 lb with a supplement conversion (pound supplement per pound of increased weight gain) of 4.72, which will often be profitable. Increased profits of $15 to $31/steer depended on supplement cost and profit potential of the cattle.

A second strategy was to develop energy supplements that could be fed in larger amounts (about 0.75% of body weight) to increase stocking rate during the fall/winter grazing period and to have more cattle on hand for spring graze-out of wheat. Two types of supplements, a high-starch, corn-based supplement and a high-fiber byproduct feed-based supplement, were compared. Over the three-year study, mean daily supplement consumption was 0.65% of body weight. This energy supplementation program increased daily gain by 0.33 lb and allowed stocking rate to be increased by one-third. Type of supplement did not influence daily gain, supplement conversion, or the substitution ratio of supplement for forage. Supplement conversion was about 5 lb of as-fed supplement per pound of increased gain per acre, and it was substantially less than conversions of 9 to 10 that have traditionally been used in evaluating the economics of energy supplementation programs for wheat pasture stocker cattle.

The third strategy was to limit-feed energy supplements in amounts of 1% of body weight in situations of very low initial wheat forage standing crops (i.e, 300 lbs DM/acre). Weight gain of steers stocked on wheat pasture to provide initial forage allowances of 1,000 lbs to 1,300 lbs DM/steer and limit fed whole shelled corn at a level of 0.75% to 1% of body weight were about 2 lbs/day during two separate wheat pasture years.

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