

## University of Missouri Extension

G2072, Reviewed October 1993

# Grain and Protein Supplements for Beef Cattle on Pasture

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Feeding grain to cattle on pasture can be a profitable way to grow and finish cattle on many Missouri farms. Some purposes for supplementing pasture with energy and protein are:

- To lower the feed cost of beef gains.
- To increase the number of stocker cattle grazed per acre.
- To lower the slaughter weight at which large-frame cattle have choice grade carcasses.
- To hasten the marketing date of grazed cattle that are to be finished for slaughter.
- To supplement pasture during drought or seasons of low production.

## Greater response in summer

Cool-season grasses mature in summer and become too low in energy and protein to meet the requirements of stocker cattle. Unless these pastures contain a considerable quantity of legume, cattle don't make acceptable rates of gain in late summer.

Drought also reduces the quantity of forage available in summer pastures. The primary goal of feeding protein and energy supplements to cattle on pasture is to supplement but not replace pasture as a feed.

Feeding supplements to cattle on pasture is likely to be more profitable in July and August when grasses are lower in nutrient value and cattle respond more to supplemental feeding. A Missouri study showed no response from feeding 3 pounds of corn or 3 pounds of a mixture of corn and a high-protein feed for steers grazing a fescue-ladino pasture that furnished excess forage in May and June.

However, some 800-pound cattle fed 4 pounds of corn or 3 pounds of corn and 1 pound of soybean meal per head daily on these same pastures from mid-June to early September gained 0.54 pounds more per head daily than those without supplements. An extra pound of gain took 7.4 pounds of supplement. No response was noted from adding soybean meal to the corn for these heavyweight cattle.

Kansas studies showed an increase in average daily gain per steer of 0.35 pounds from late summer supplements of 1 to 2 pounds of feed per animal for steer grazing range grasses. They noted that when the forage remains green all summer, there may be little response from late summer

supplements.

## Protein supplements

Feeding 0.8 to 1.0 pounds daily per head of soybean meal, cottonseed meal or a similar 40 percent protein supplement has been more profitable for cattle on range grasses in late summer than higher levels of a grain supplement in Oklahoma comparisons. These western range grasses decline greatly in protein in late summer. Feeding protein increases the digestibility of these mature grasses and increases their consumption when protein is deficient; feeding 3 pounds or more of an energy supplement usually decreases consumption of the forage. High protein supplements give the best response when the forage is low in protein but abundant in quantity.

Energy may be deficient on Missouri pastures in late summer since fescue, orchard and brome grass pastures don't drop as low in protein as is characteristic of the range grasses. Thus, energy may be a greater need than protein to supplement these types of Missouri pastures in summer.

## Escape protein

Grazing trials at the University of Nebraska showed steers with initial weights of 550 to 600 pounds benefitted from supplemental escape protein when grazing brome grass pastures from late April to early July. Adding 0.5 pounds of escape protein per head daily increased average daily gain above a corn starch energy supplement by 0.36 pounds per head daily; adding 0.25 pounds of escape protein increased average daily gain by 0.25 pounds per head daily. The forage had 20 percent protein on a dry matter basis in early spring, but analyses indicated 95 percent of the protein was rumen degradable.

A two-year study at MU showed no response from adding escape protein (blood meal-corn gluten meal) vs. soybean meal to 3 pounds corn fed per head daily to 650- to 700-pound steers grazing fescue pastures during May and June.

## Grain supplements for stockers

Limiting grain supplements to 0.5 to 1.0 percent of body weight usually requires less grain for an extra unit of gain than full-feeding grain to cattle on pasture. Feeding large amounts of energy with forage reduces the fiber digestibility of the forage. Also, cattle will substitute grain for grass when large amounts of grain are fed with good quality forage. This results in little increase in daily gain and large amounts of grain needed for additional gain.

In Kansas trials, feeding 4 pounds of rolled milo per head daily to steers grazing bermuda grass pastures for 112 days gave higher subsequent feedlot gains, fewer days in the feedlot and higher overall performance than feeding 0 or 2 pounds milo.

## Increase stocking rates

For the most efficient use of grain supplements with pasture, the stocking rate of the cattle must be balanced with the pasture. The stocking rate should be increased when grain supplements are fed, since the cattle will eat less pasture. In University of Oklahoma studies, it took 15 to 30 pounds of grain for each pound of gain increase if grass was surplus, but only 8 to 10 pounds if grass and cattle were balanced. The carrying capacity of the pasture increased by 25 to 30 percent when grain was fed at 1 percent of body weight (5 to 7 pounds per head per day).

Raun, A.P. (1979) of Elanco Products Company reported a summary of eight trials that showed stockers fed forage averaged 0.61 less forage dry matter intake for each pound of grain consumed daily. The stocking rate to fully use the pasture increased 4.2 percent for each pound of grain fed per head daily. Thus, if 4 pounds of corn is fed per head daily, the stocking rate would need to be increased by 1/6 or 16.8 percent to fully use the forage.

In a four-year trial with grasses and grass-legume pastures in Wisconsin, feeding corn at 1 percent of body weight to steers increased the carrying capacity of pastures by 15 percent from May to September and 17 percent from October to November.

Feeding corn at the rate of 1 percent of body weight in the Wisconsin trials increased average daily gain by 0.42 pounds per head from May to September, but gave no increase in daily gain from October to November. Supplemented steers grazing grass-birdsfoot trefoil pastures had 23 percent faster average daily gains in spring and summer. Corn feeding increased daily gain on bluegrass pastures by 30 percent and increased average daily gain on brome grass by 28 percent. The lesser increase from corn feeding on the birdsfoot trefoil-grass pasture indicates these cattle were better able to meet their energy intake requirements than those grazing the grass pastures.

## Highly digestible fiber feeds

Feeds such as soybean hulls and corn gluten feed have low starch but a large component of highly digestible fiber. These high-fiber feeds reduce the fiber digestibility and feed intake of roughages less when they are used as energy supplements to roughage rations than do high-starch grains such as corn, milo or wheat. Studies at MU and other stations show that feeding 3 to 6 pounds of soybean hulls or corn gluten feed per head daily to cattle on forage gives equal or greater performance than using a similar amount of corn grain.

## Feeding method

Supplements can be hand-fed daily. If fed at 0.5 percent of body weight or less, every other day is satisfactory. Salt mixes work well. Adding 10 percent salt to a grain supplement will hold consumption to about 1 percent of body weight. About 15 percent salt is needed to limit grain to 0.5 percent of body weight on most pastures. If Rumensin is included, less salt is needed. It will take 30 percent or more salt to limit a protein supplement to 1 pound daily consumption. Use plain salt instead of trace mineralized salt to prevent overfeeding of some minerals. Tallow or other fat can be substituted for salt to control intake.

If cattle are hand-fed supplements, the time of day that the supplement is fed appears to affect the amount of forage that the cattle will consume. Cattle have intensive grazing peaks at dawn and dusk, with most grazing occurring in daylight hours. Feeding supplements in the middle of the day will be less disruptive on normal grazing activity and will cause cattle to eat more forage than if supplements are fed early in the morning.

## Implants, ionophores, antibiotics

Growth implants will increase the daily gain of steers fed supplements on pasture by 12 to 15 percent and increase total gain by 20 to 30 pounds in a 130-day pasture period. A second implant of Ralgro at mid season increased the total pasture gain of steers by 9.5 pounds in a summary of 11 Missouri farm trials.

Rumensin or Bovatec fed at 150 to 200 milligrams per head daily in grain or protein supplements has increased the gain of steers and heifers on pasture by approximately 0.15 to 0.20 pounds per head daily. In a summary of nine trials, Rumensin or Bovatec increased the average daily gain of stockers on pasture by 0.12 pounds when the ionophores were fed in free-choice mineral mixes or molasses blocks. Rumensin was consumed at an average level of 103 milligrams and Bovatec at 123 milligrams per head daily.

An increase in daily gain has been shown in some trials where steers and heifers on summer pasture have consumed around 350 milligrams of Aureomycin per head daily in salt-mineral mixtures. Cattle fed this level of antibiotics in their mineral mixture averaged 0.1 pounds higher average daily gain in a summary of five trials. The response appeared to be greater where eye infections were a problem.

## Grain to finish cattle on pasture

Feeding 0.8 pounds to 1 pound of grain per 100 pounds of body weight gave the greatest profit in finishing cattle on grass in a 7-year study at North Carolina. A mixture of 10 percent animal fat and 90 percent ground shelled corn or milo produced this level of grain intake on fescue-ladino, orchard grass-ladino and other pasture combinations.

Ten percent salt in the concentrate provided similar results to that obtained with fat. However, the fat addition proved more profitable than salt in their trials. Adding 15 percent salt to the mixture reduced consumption to 0.5 pounds of grain per 100 pounds body weight of the steers. A limited feed of grain with pasture saved about 50 percent of the grain plus the protein supplement and roughage needed for cattle finished in dry lot.

## Protein level

Work at MU and elsewhere does not show that protein supplementation is profitable for grain rations fed at 10 percent or more of body weight to cattle on grass-legume pastures, grasses fertilized with nitrogen or grasses in an early stage of growth.

The grain ration will not need to supplement the forage for protein except when pasture growth is of poor quality because of advanced maturity or drought. A level of 10 to 12 percent crude protein in mixed feed should be adequate under most conditions. A mixture of 14 parts of corn or milo and one part of 40 percent protein supplement has approximately 11 percent crude protein (as fed).

## Steps to low-choice slaughter cattle

- Start with 550- to 700-pound steers or 500- to 600-pound heifers.
- Use cattle that have been wintered to gain 1.25 to 2.0 pounds daily.
- Allow about 0.5 to 1 acre of grass or grass-legume pasture per head.
- Implant steers and heifers with growth stimulants and use Rumensin, Bovatec and/or MGA in the ration.
- Follow veterinary recommendations on deworming before cattle go to pasture.
- Feed grain on pasture at the rate of 1 pound of grain per 100 pounds of body weight.
- This rate of consumption can be obtained by self-feeding a mixture of 90 percent corn or milo and 10 percent fat or 10 percent salt.
- Supply a mineral mixture consisting of equal parts dicalcium phosphate and trace-mineralized salt.
- Provide plenty of shade and control external parasites with back rubbers, dust bags, sprays or ear tags.
- Market animals with 80 percent in low-choice grade. Steers should reach this grade at about 1,050 to 1,250 pounds and heifers at 1,000 to 1,100 pounds.
- A full feed of grain in dry lot for 30 to 60 days may be needed to finish the cattle.
- Change to a full feed of grain when pasture becomes scant or low quality.

## Full feeding grain on pasture

Five years of data at Purdue University showed cattle full-fed grain on brome-alfalfa pasture needed 100 pounds less grain for each 100 pounds gain than cattle fed in dry lot. This is a reduction of 1.8 bushels of corn for each 100 pounds of gain.

An acre of pasture carried four to five steers and saved approximately one ton of grain. Stock pastures heavier when grain is fed to make full use of pasture forage. Pastures often are not as productive as those in this study, so lower stocking rates and feed savings would result.

When the pasture was green and growing, no supplemental protein was needed for cattle full-fed grain. Whole corn was slightly superior to rolled corn for cattle fed grain on pasture in the Purdue studies. Less trouble with founder and other rumen disorders was experienced with whole corn.

## Delayed grain feeding

Another method of full-feeding grain on pasture is to stock a pasture at its full carrying capacity in the spring and delay grain feeding for 50 to 60 days. Then start a full feed of grain no later than the first of July, when grass pastures usually are declining in quality and quantity of forage.

The carrying capacity of the pasture can be maintained by supplementing the pasture with grain through the summer months. Whole shelled corn can be used. Milo can be used instead of corn. Wheat can constitute up to 50 percent of the grain. But the milo and wheat must always be rolled or ground for cattle.

Some trials have shown that delaying a full feed of grain until 50 to 60 days after the cattle are put on pasture will decrease the amount of corn needed to finish cattle to low choice grade by 10 to 12 bushels per head compared to full feeding grain from the time cattle start on pasture.

## Starting on self-feeder

Cattle full-fed on pasture may be started on a self-feeder at once if a mixture of 50 percent roughage and 50 percent ground grain is provided at first. The roughage can be cut to 30 percent and then to 20 percent at 5- to 7-day intervals.

Offer straight ground grain or shelled corn by the end of the third week. Cottonseed hulls, ground corn cobs, ground hay or other roughages can be used. Provide one foot of trough space for every three animals.

## Foundering

Foundering is more likely to occur if cattle graze a long distance from the self-feeder or if the water supply is not close to the feeder. Also, foundering can occur in heifers that over-eat after having reduced their feed intake during a long heat period. A ration lower in energy than shelled corn is better suited for feeding heifers on grass.

Cattle may founder if pastures become lush from fall rains and cattle prefer the pasture to the grain and lose their adaptation to grain. To avoid foundering:

- Don't let feeder get empty.
- Remove any moldy feed and tend feeder often.
- Consider feeding steers and heifers separately.
- Regulate the size of the field or add more self-feeders when a large number of cattle are grazed on a large acreage.
- Control stocking rates so that an excess of palatable pasture does not accumulate while cattle are being self-fed grain.

## Vitamin A

Good quality pasture should be high in carotene and provide an abundance of pro-vitamin A for beef cattle. However, high-nitrate feeds and unidentified factors can interfere with the use of carotene by beef cattle. Vitamin A supplementation has increased performance in a few trials where cattle were full-fed grain on pasture.

Provide 20,000 IU of vitamin A per head daily to maintain body stores of vitamin A when pastures are mature, especially if cattle are to be fed corn silage or full-fed grain for an extended period after the grazing season.

G2072, reviewed October 1993

## Related MU Extension publications

- G2058, Vitamins for Beef Cattle  
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=G2058>
- G2066, Rations for Growing and Finishing Beef Cattle  
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=G2066>

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■ Issued in furtherance of the Cooperative Extension Work Acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. Director, Cooperative Extension, University of Missouri, Columbia, MO 65211  
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