# Strip-Grazing Milo as a Low-Cost Winter Forage

Minimizing the cost of winter feed is a key element of profitability on most pasture-based livestock operations. Baled dry hay is the industry standard for feeding cattle and small ruminants throughout the winter. Challenging weather often complicates the hay-making process. Some producers around the state have reduced their hay crop in exchange for stockpiled milo for their winter forage needs. Strip-grazing standing milo eliminates the costs associated with harvesting and transporting hay and forgoes milo harvesting costs; resulting in much lower daily feed costs compared to traditional baled hay.

**Figure 1.** Milo provides a large quantity of forage per acre for grazing livestock.

## System basics

The basics of milo stockpile grazing are like other management-intensive grazing systems. Ideally, milo is planted into fields with existing perimeter fencing and a good water supply. When the milo is mature and feed supplies are transitioning to stored forages, it is time to begin allocating milo for daily strip-grazing.

The recommended daily allocation depends on cattle stocking rate and milo yield. Based on 15 years of research perfecting the milo grazing system, University of Missouri Extension agronomist Rusty Lee recommends feeding 10-13 pounds of grain per cow per day. A grain-only allocation is used as it is difficult to quantify the fodder in the field, but grain yield increases along with fodder so the two are closely connected. Forage utilization rates can be up to 75 percent of total milo biomass if the allotments of milo restrict loafing and encourage the animals to eat all the fodder.

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## Production costs

The first part of implementing an annual forage grazing system is growing the crop. Corn planting equipment can be used for milo. However, milo can be successfully planted with a grain drill if you do not have access to a row crop planter.

MU Extension publishes a Grain Sorghum Planning Budget (extension.missouri.edu/publications/g653), updated annually. Table 1 summarizes the operating costs of producing milo yielding 105 bushels per acre.

**Table 1. Operating costs of producing milo in Missouri, less harvesting, in dollars per acre.**

| | |
|---|---|
| Seed | 10.80 |
| Fertilizer and soil amendments | 90.70 |
| Crop protection chemicals | 34.00 |
| Crop supplies | 2.50 |
| Custom hire and rental | 7.50 |
| Machinery fuel | 21.76 |
| Machinery repairs and maintenance | 11.58 |
| Management expense | 14.33 |
| Operating interest | 8.69 |
| **Total operating costs** | **201.85** |

Annual operating costs per acre are lower for tall fescue-clover mixed hay, compared to milo. The full planning budget for mixed hay yielding three tons per acre in Missouri can be found in MU Extension's Fescue-Clover Hay Planning Budget (extension .missouri.edu/publications/g666). Table 2 shows annual operating costs for mixed hay.

**Table 2. Operating costs of growing and harvesting established fescue-clover hay, in dollars per acre.**

| | |
|---|---|
| Seed | 0.00 |
| Fertilizer and soil amendments | 102.87 |
| Crop protection chemicals | 0.00 |
| Crop supplies and storage | 15.00 |
| Custom hire: fertilizer application and bale hauling | 31.63 |
| Machinery fuel | 5.93 |
| Machinery repairs and maintenance | 18.06 |
| Operator and hired labor | 14.24 |
| Operating interest | 8.45 |
| **Total operating costs** | **196.18** |

## Fencing

There are two types of fencing used in the milo grazing system: exterior and interior. Exterior fencing — high tensile wire, barb wire, woven wire or some combination of these three — may or may not be electrified. To maintain forage quality and keep utilization rate high, portable fencing must be used to separate the grazed area from the standing milo in the remainder of the field. Electric fence is an inexpensive and convenient way to keep cattle out of the milo not included in their daily allotment. Since milo is an annual crop, there is no need to install a back-fence to prevent the livestock from grazing previous allotments; only one stretch of temporary fencing is necessary.

**Interior fence must be moved every day** *and should be constructed accordingly to minimize the amount of time spent moving it.*

Table 3 shows the costs per foot of constructing and maintaining both permanent perimeter and portable interior fences. The cost estimates below do not include labor to move the electric interior fence for each milo allotment. A general rule of one hour per one-quarter mile of fence assuming a single wire with step-in self-insulating posts. Driving down milo with an ATV or UTV creates the pathway for a single-strand fence utilizing step-in posts.

## Daily allocations

There are four factors in estimating the daily allocation of milo for your herd: stocking rate, consumption rate, utilization rate and milo yield. Most mature cows will consume about three percent of their body mass daily. A 1,200-pound cow needs about 36 pounds of forage per day. Experienced milo grazers have found that 10-12 pounds of milo grain provides an appropriate intake, including the milo fodder. However, the grain-based allocation may change because varying growing conditions can change the ratio of grain to forage.

Milo yield is difficult to estimate prior to harvest. Components of milo yield include heads per acre, seeds per head and seed weight. Like corn, it is easy to calculate the number of heads in a stretch of row and extrapolate that area to find the yield per acre. However, milo heads are not uniform and can have over 4,000 seeds per head, making it nearly impossible

**Figure 2.** Temporary electric fence is an easy and inexpensive way to separate daily allotments of milo from the herd.

**Table 3. Fence construction costs, per foot.**

| Fence type | Units | Woven-wire + barbed wire | 5 barbed-wire | 6-wire high-tensile | Electric high-tensile | Electric interior fence |
|---|---|---|---|---|---|---|
| Labor cost | Dollars per foot | 1.50 | 1.40 | 1.12 | 1.06 | 0.13 |
| Material cost | Dollars per foot | 2.59 | 2.15 | 1.74 | 1.91 | 0.68 |
| Total cost | Dollars per foot | 4.09 | 3.55 | 2.86 | 2.97 | 0.81 |
| Fence lifespan | Years | 25 | 25 | 30 | 30 | 7 |
| Annual maintenance cost | % of construction cost | 7.0% | 7.0% | 6.0% | 7.0% | 7.0% |
| Annual cost of constructing and maintaining fence | Dollars per foot | 0.78 | 0.67 | 0.50 | 0.54 | 0.24 |

to estimate yield. For a new grower of milo, it may be easiest and most accurate to consult your agronomist or an experienced milo producer to visually assess the yield. A visual assessment will likely not be accurate enough to determine the final daily allocation but can be a helpful starting point.

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Ultimately, the allocation of milo comes down to cow-days per acre. These are the steps to determine cow days per acre in this scenario:

- 105 bushels/acre milo × 56 pounds/bushel = 5,880 pounds/acre
- 5,880 pounds/acre × 75% utilization = 4,410 usable pounds
- 4,410 usable pounds ÷ 11 pounds/cow/day = 400.9 cow days/acre.

Next, determine the daily allocation by:

- Dividing the number of cow-days/acre by the number of cows in the herd to effectively find herd-days/acre.
- Divide the area of an acre (43,560 sq. ft.) by the number of herd-days per acre to find the square footage needed for a daily allocation.
- Divide the daily allocation area by the width of your pasture where the temporary fence will run to find out how far you will move the wire every day.

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## Labor needs

Labor is required to manage daily allocations of milo. Giving an allocation larger than one day's grazing results in over-feeding the first day and wasted grain from trampling and under-feeding on the additional days before moving to the next allocation. Cattle that respect an electric fence is a requirement as portable electric fencing keeps the labor manageable. Producers consistently report the daily time commitment being about 30 minutes.

Labor requirements are mostly independent of herd size. Producers report needing the same 30 minutes to feed 30 head or 300 head. However, wider paddocks (the distance spanned by the temporary fence moved daily) require more daily labor than narrower paddocks of the same area. The time required to feed hay increases as herd size increases. Moving feed bunks or supplement tubs are unnecessary in a milo grazing system. The ground near the prior day's portable fence-line will be clear enough to feed due to driving down the milo before installing the fence and the natural inclination of the cattle to create a track near the boundary.

## Nutritional value of feeding milo

The most common use of grazing standing milo is for beef cow diets. Given the mix of spring and fall calving herds across Missouri, distinguishing nutrient requirement differences between the groups is important. The spring-calving cow will be in the third trimester of gestation when grazing standing milo whereas a fall-calving cow will have calved and be near peak lactation, which coincides with a beef cow's greatest nutrient requirements.

To avoid weight loss, beef cows in the last trimester of gestation require a diet that is greater than 55 percent total digestible nutrients (TDN), whereas an early lactation beef cow needs a diet of at least 60 percent TDN. Tall fescue hay harvested across Missouri rarely tests at 60 percent TDN and often near 50 percent TDN. When producers provide supplemental feed to beef in conjunction with hay, energy from the supplement is most needed by cows.

Analysis of milo heads regularly return TDN values above 70 percent and milo fodder (leaves and stems) routinely test approximately 55 percent TDN. Energy is not limiting when grazing standing milo, so long as cows are allocated 10-13 pounds of grain and 18-20 pounds of fodder. Table 4 contains a simple nutrient analysis of whole-plant milo forage. Note that weather, grain-to-fodder ratio, date of sampling and many other factors may affect the nutritional value of whole milo plants.

**Table 4. Basic nutrient analysis for whole-plant milo forage.**

| | Unit | As-is basis | Dry basis |
|---|---|---|---|
| Moisture | percent | 31.12 | |
| Dry matter (DM) | percent | 68.88 | |
| Crude protein | percent | 5.00 | 7.20 |
| Acid-detergent fiber (ADF) | percent | 8.84 | 12.83 |
| Net energy for maintenence | Mcal per pound | 0.58 | 0.84 |
| Total digestible nutrients (TDN) | percent | 52.94 | 76.86 |

Crude protein is often the first limiting nutrient when grazing standing milo. Use of a ration balancing program shows a 0.49 pounds of crude protein deficiency in a diet containing two parts milo stalks and one part milo grain. Producers grazing milo are encouraged to provide a minimum of 0.5 pounds of crude protein per cow per day to optimize feed digestion. For example, two pounds of dried distillers grains on an as-fed basis (88 percent dry matter; 30 percent crude protein) will provide 0.53 pounds of crude protein. Crude protein can be fed as little as twice a week, so long as the amount fed averages at least 0.5 pounds of crude protein per cow per day (6 pounds of dried distillers grains fed every third day). Self-fed protein supplements are also an option but producers should be aware of significant day-to-day variation in self-fed supplement consumption.

Adaptation from forage to grain-based diets is generally recommended when feeding beef cattle. Grazing standing milo may be an exception to this rule. The rate of rumen starch fermentation is slower for milo than corn. Milo grain has a hard outer shell that is resistant to digestion, and ruminants are not efficient at grinding whole milo due to their lacking of upper teeth. Do not give unrestricted access to a milo field due to the preference for grain over fodder, as well as the risk of rumen acidosis and other digestive disorders. However, the risk of acidosis is modest when allocating feed daily.

Winter weather can substantially increase nutrient requirements, with extreme cold and cool dampness increasing energy requirements. Do not hesitate to increase the daily allocation of grain by 20 to 30 percent during adverse weather. This provides extra energy to help offset the impacts of cold stress.

## Feed value per acre

Acreage available for feed production is limited on many farms. The potential 401 cow-days per acre in a milo grazing system is higher than nearly all perennial forages, grazed or harvested. A Missouri hay crop may annually yield about 3 tons, or roughly 180 cow-days per acre. However, a fescue stockpile will often be no more than 60 cow-days per acre. This means that 6.5 acres of stockpiled fescue would be needed to provide the same winter grazing as an acre of milo. For fescue-clover hay, the land needed would cost $227.50, assuming a $35 per acre rental rate. If cropland for milo can be rented at $130, producers will experience $97.50 in land cost savings for each acre of milo grazed.

Milo grazing also offers a substantial advantage over feeding dry hay in the winter in terms of feed cost per cow per day. Assuming 105 bushel per acre milo yield with operating costs of $201.85, we find that the operating investment into the milo is $1.92 per bushel, or $0.03 per pound. If each cow is allotted 13 pounds of milo grain and the associated fodder daily, the cost of fed milo per cow/day is $0.45. This example reflects the cash-based costs of grazing milo. Alternative outcomes for the milo crop may value feed per cow per day differently.

Compared to grazing milo, feed costs are typically much higher in a hay-based winter feed program. If forage growers in Missouri can produce fescue-clover hay yielding 3 tons per acre with operating costs of $196.18, the variable cost of the hay is $65.39 per ton, or $0.03 per pound. A 1,200 pound cow consuming 3 percent of her body weight in dry matter daily would eat 36 pounds of hay daily at a cost of $1.18 per cow per day. In this scenario, the daily feed cost for a cow eating hay as its primary feed would be over 2.6 times that of one eating a milo-based diet.

## Crop production implications

Grazing cattle in row crop fields can lead to excessive pocking from hoof traffic. Fields will likely be rough in spring if they were wet while grazing. For this reason, producers adopting this system will likely have to use conventional tillage practices on acres grazed. Additionally, significant investment must be made in perimeter fences and water access in each field where milo is grazed. These sunk costs incentivize continuously planting milo on the same fields. The early adopters of milo grazing systems have found that milo can be grown continuously for four to five years. Milo can also be planted into late June across Missouri with no yield loss, permitting a system using a cool season crop in the spring prior to seeding milo in early summer.

Field surface damage from hoof traffic can be managed by keeping cattle close to a separate area to be used as a sacrifice when there are excessively wet conditions. There, livestock can eat other stored forages to minimize the damage done to the milo field. The economic benefit of a sacrificial lot will typically not offset the higher feed costs of feeding stored forage. The benefit of pulling animals out of the field are mostly aesthetic. If animals damage wet fields, producers will bear those costs with added input costs or lost yield on the subsequent crop.

This guide is for informational purposes and the user assumes all risks associated with its use. If you have any questions about the information in this guide, please contact Rusty Lee at leerw@missouri.edu for guidance.

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