Calculating & Comparing Forage Production Costs

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Forage and feed are a substantial part of milk production costs. Forage production costs are variable and depend on a number of inputs (seed, fertilizer, cutting schedule, machinery use/fuel, labor, custom work, and storage) and outputs (yield, quality, and animal productivity). Interpreting forage production costs should be considered since a high-yielding forage may have a lower cost per ton, but can result in lower milk production potential. Allocation of forages to appropriate groups optimize the use of different quality forages and help reduce production costs.

Table 1. Production costs (combined with winter rye forage costs).

	Winter Rye & Corn Silage	Winter Rye & Cocktail Mix	Winter Rye & Annual Ryegrass	Alfalfa
Combined Yield	8.0	4.6	4.8	4.4
Seed $/ac	$123 ($30+$93)	$83 ($30+$53)	$44 ($30+$14)	$15
N $/ac	$74 (urea 2x)	$32 (urea 1x)	$32 (urea 1x)	$0
K_20 $/ac	$0	$0	$0	$43 (½ removal)
Fertilizer Spreading, Herbicide, Scouting $/ac	$96	$77	$167	$134
Interest $/ac	$23	$15	$19	$16
Planting/Tillage $/ac	$40	$40	$40	$5
Harvest $/ac	$215 ($70+$145)	$280 (4 x $70)	$420 (6 x $70)	$280 (4 x $70)
Future N Credits	$0	-$18	-$18	-$20
Total Costs $/ac	$570	$510	$704	$476
Costs/ton DM	$70/ton DM	$110/ton DM	$147/ton DM	$108/ton DM
Milk/ton Forage DM[1]	3560 lb milk	3050 lb milk	2875 lb milk	2900 lb milk
Forage Cost/lb Milk	$0.019	$0.036	$0.051	$0.037

[1]Milk production from forage using forage analysis & MILK2006 (corn silage) or MILK2016 (alfalfa/grasses) equations.

Calculation of these costs can allow for monitoring and adjustments to crop management. Keeping track of expenses and yields is important to conduct the analysis. Budget tools are available through University of Wisconsin-Ext to help estimate expenses, inputs, and yields to develop budgets (farms.extension.wisc.edu/topics/budgets-and-benchmarks). An example budget (Table 1) was made in 2019 to calculate costs of production for a farm cropping system using a winter rye forage combined with BMR corn silage, Italian ryegrass, or a cocktail forage mix in comparison to alfalfa silage (from the May 2020 MFA *Forage Focus*). The budget includes expenses for seed, nitrogen (N) fertilizer application, potassium removal, tillage/planting, manure hauling, pesticide/herbicide application, and future N credits for legume crops.

Corn silage had the highest seed and fertility costs per acre, but lowest overall harvest costs. The high corn silage yield resulted in the lowest forage cost per ton. Of the crops under a multiple harvest system, alfalfa silage and winter rye/cocktail mix system had similar costs per ton at ~$108-110/ton dry matter (DM). The main differences between crops were lower seed, tillage/planting, and alfalfa N costs, but lower manure application costs (custom manure applicator for this operation) and cocktail mix potash costs. Both had similar harvest costs due to both having four harvests. Winter rye/Italian ryegrass system had higher manure application costs due to a greater number of spreading events between harvests. Also, the winter rye/ryegrass crop was harvested six times, drastically increasing costs with only moderate yield increases (4.8 tons DM total) compared to 4.4-4.6 tons DM/ac across four harvests for alfalfa and cocktail mix.

Perennial forages can help control costs due to lower seed and establishment/planting costs. A multiple harvest system needs to be managed to optimize forage yield and quality. Reducing cuttings from five to four and having a longer harvest interval between one of the cuttings can result in similar overall yields. Quality of three of the harvests would be higher for lactating cows, while one of the cuttings will be of lower quality for feeding dry cows or heifers. This strategy reduces costs due to one less harvest event while improving plant carbohydrate reserves and reducing wheel traffic/compaction. Work with your nutritionist and agronomist to determine opportunities for adjustments to harvest schedules.

Forage cost per unit of milk produced provides valuable information into the most profitable forages for producing milk. Using cost per ton data and estimated milk per ton (MILK2006 and MILK2016 spreadsheets), cost per lb of milk from forage intake can be determined. This metric combines the forage quality aspect (lb milk/ton) and production costs to better determine which forages are most profitable for milk production. As expected, corn silage had the lowest forage cost ($0.019/lb milk) due to its lower cost per ton and explains why it is a predominant forage on most dairy farms. Alfalfa silage and the winter rye/cocktail mix had similar forage costs ($0.036-0.037/lb milk),

while the winter rye/Italian ryegrass had higher cost ($0.051/lb milk). Evaluating opportunities to improve yield and quality through improved genetics, fertility management, or harvest management can lead to lower cost per unit milk.

For dry cows and heifers (especially bred or pregnant heifers), dairy producers should focus on cost per ton, since high energy forage is not needed and can even be detrimental. Use of lower-cost, higher-fiber forages such as more mature hay or forage sorghum can help control costs. For example, the production costs per acre for a single harvest forage sorghum or sorghum-sudangrass is ~$350-400 due to lower seed and fertilizer costs. With a conservative yield estimate of 6 tons DM/ac based on central Wisconsin plot data, the cost per ton DM is $58-66, making this a reasonable value forage to feed heifers. Mature perennial grasses or long-day/immature corn silage can also work well for these animal groups and can be economical to produce.

Developing forage production budgets can be useful to determine which forages are providing the most value and opportunities to improve management and control costs. It is best to use actual farm data for making budgets, as each farm's cropping operation is unique.