

Reduced Starch Rations Can Reduce Forage Digestibility



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As grain prices have risen the last couple of years, it is tempting for farmers to experiment with feeding less grain to their cows. Some producers want to reduce the amount of grain fed to their cows in an attempt to “save” money and are not willing to feed the amount of grain needed

to balance the ration properly. There are unintended consequences to feeding inadequate amounts of grain to dairy cows such as: lower milk production, excessive body weight loss, poor reproduction and reduced forage digestion. This article will compare the estimated profitability of two different rations: 1. A moderate starch ration where cows are receiving additional grain and corn silage. 2. A low starch ration where cows are not receiving any additional grain but are still being fed corn silage. We will also compare the ration cost, body weight loss replacement cost, milk income and income over feed costs for these two different rations to demonstrate how each feeding style impacts overall profitability.

Ration Cost Comparison

Using current conventional grain and forage prices, I formulated two different rations to compare overall

ration costs. Dry matter intake (DMI) was estimated at 50# in each ration. Dry hay, corn silage, salt and mineral amounts stayed the same in each ration. Haylage and grain amounts varied depending on each ration. The “Moderate Starch” ration included supplemental grain in addition to corn silage. The “Low Starch” ration did not have any supplemental grain but corn silage was still fed. **Chart 1** shows that the initial feed cost for the “Moderate Starch” ration is \$0.74/head/day higher than the “Low Starch” ration. For a 50-cow herd, that is a difference of \$13,505 per year.

Digestibility of forages also needs to be considered and variation is demonstrated in these two rations. TMR digestibility can range between 48 and 83 percent with an average of about 65 percent (Progressive Dairyman #2). Forage digestibility in the “Moderate Starch” ration was estimated at 60%. Grain (including grain from corn silage) was estimated at 99% digestibility. Because there is a direct correlation between the need for adequate dietary starch levels to support good forage digestibility, the “Low Starch” ration digestibility was estimated at 48%. Chart 1 shows that in this scenario, there is a difference of 10.25 digestible mcal between the “Moderate Starch” ration and the “Low Starch” ration. Dairy cows themselves do not have a starch requirement, but they do have a carbohydrate (glucose) requirement. The rumen micro-

Chart 1: Ration Cost Comparison

Ingredients:	\$/ton	Moderate Starch (#/hd/day)	Low Starch (#/hd/day)
Dry Hay	\$250	5	5
Haylage	\$90	51	78.5
Corn Silage	\$55	30	30
Shell Corn	\$250	10.75	
SBM-48	\$425	3	
Salt	\$200	0.25	0.25
2:1 Dairy Mineral	\$1,478	0.5	0.5

	Moderate Starch (#/hd/day)	Low Starch (#/hd/day)
Dry Matter Intake (#)	50	50
\$/hd/day	\$6.12	\$5.38
\$/50 cows/day	\$306	\$269
\$/50 cows/year	\$111,690	\$98,185
Starch Level (%)	22.91	9.26
Nel (mcal)/lb	0.72	0.66
Nel (mcal)/day	35.87	33.2
Total TMR Digestible Nel (mcal)	26.19	15.94

* Digestibility of each ration will impact overall herd performance.



flora does, however, have a starch requirement which is necessary to conduct effective fermentation. Ideally, total ration carbohydrates (starch and sugar) should be approximately 30% in the overall ration. When the rumen is functioning properly, with all of the requirements met, rumen bugs can grow and provide more microbial protein that will decrease the need for supplemental protein and improve forage utilization. Even highly digestible forages do not provide the level of carbohydrates needed to fully support optimum rumen fermentation and fiber digestion. Without adequate starch levels, fiber digestion will be significantly reduced. Simply put: grain is necessary to support rumen microbe growth and subsequently, effective forage digestion in the rumen.

Body Weight Loss Comparison

After freshening, cows will typically lose body condition

Chart 2: Body Weight Loss Cost Replacement

	Moderate Starch	Low Starch
Body Weight (BW) Loss	0.5	0.5
# TMR to replace BW loss (as-fed)	765.58	1134.45
\$ for BW replacement/hd	\$46.63	\$53.42
\$ for BW replacement/50 cows	\$2,331.50	\$2,671

*This example factors in digestibility of each TMR

**Body weight loss is typically greater in Low Starch rations.

This example used the same BW loss for simplification.

and for 60 days they are in a negative energy balance. During this time, cows cannot eat enough to replace energy needed for milk production, leading to weight loss. It is a good goal to try to keep body weight loss to less than 0.50 point of body condition score (BCS) (on a scale of 1 to 5). If animals lose more than 0.50 point in BCS, they most likely have sub-clinical ketosis or some other health condition that is causing them to lose more weight off their back. It is important to note that herds fed a low starch ration are at higher risk of clinical and/or sub-clinical ketosis which even further reduces the cow's ability to utilize their diet, including forage. **Chart 2** compares the amount of feed and the costs associated when trying to gain back the 0.50 point of BCS they lost during lactation. The "Moderate Starch" ration was the most economical while the "Low Starch" ration costs more and needed the most feed to gain body weight back. To simplify this comparison, I predicted that all animals

on each of the rations lost 0.50 point in BCS. However, since the "Low Starch" ration is not meeting ration requirements, animals on this ration will most likely lose more condition throughout the course of lactation. If a herd is on a low starch ration and is able to maintain body condition, it is generally because milk production is very low.

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Milk Income Comparison

Milk income on each ration was also compared. **Chart 3** used NRC guidelines for production, maintenance and growth. I estimated the milk price at \$20/cwt. Based on ration energy levels, the “Moderate” ration will easily support 65#/head/day. The “Low Starch” ration will only support 49.3#/head/day. Again, this does not take into consideration how the ration will actually be utilized in the cow. For herds feeding no grain, milk production can be highly variable but can get as low as 30#/head/day, especially if ketosis is prevalent. Herds with sub-clinical ketosis can easily have a 10 to 40% drop in production. Milk income from a “Moderate Starch” ration, in this example, was \$237,250.00 for 50 cows per year. Milk income from a “Low Starch” ration was \$179,945.00. That is a difference in income of \$57,305 per 50 cows in a year or \$1,146.10 per cow per year.

Income Over Feed Costs

Chart 4 evaluates feed cost for 50 cows per year, the body weight loss cost replacement for 50 cows and the milk income derived from each ration. Feeding grain is more profitable than not feeding grain. Comparing a “Moderate Starch” ration with a “Low Starch” ration, there is a difference in profitability of \$44, 139.50 for 50 cows per year. That is \$882.79 per cow per year more profit over feed costs just by feeding adequate starch levels.

The above comparison is an example of how it is more profitable to be feeding a “Moderate Starch” ration in order to support good forage utilization. Ration starch should range 22-26% with ration sugar levels ranging from 5-8%. Some herds not feeding any additional grain may be able to meet

Chart 3: Milk Income Comparison

	Moderate Starch	Low Starch
** Predicted # milk/hd/day	65	49.3
Income \$/hd/day	\$13	\$9.86
Income \$/50 cows/day	\$650	\$493
Income \$/50 cows/year	\$237,250	\$179,945

* Figured milk at \$20/cwt. No component variation was calculated.

**Predicted milk based off NRC guidelines.

Also takes into consideration maintenance and growth requirements.

starch requirements with high intakes of quality corn silage, but it may be difficult to maintain the starch requirements. In addition to the issues of low ration energy, lowered milk production and decreased body condition, there are other probable negative impacts resulting from a low starch ration that were not included in this cost comparison i.e., reproductive inefficiency and poor herd health, increased incidence of ketosis and increased transition cow problems.

The Crystal Creek® Dairy Nutrition Model (CCDNM) focuses on balancing rations in a manner that will help you maximize your homegrown forages while reducing supplemental grain. Contact Crystal Creek® and speak with one of the Dairy Nutritionists for more information. Before jumping on the “No Added Grain” bandwagon, take into account the above considerations and see how it could affect your total profitability. You could be losing over \$800 per cow per year by not feeding grain!

Resources:

1. Hoffman, Karen. “No-grain Dairy: Potential Benefits, but Handle with Care.” (1 Jan. 2007): Graze Magazine. Web. 08 May 2013.
2. Goeser, John. “TMR Digestibility: Field Results, Ration Changes and Outcomes.” (3 April 2013): Progressive Dairyman. Web. 08 May 2013.
3. Milkproduction.com. Web. 08 May 2013.

Chart 4: Income Over Feed Costs

	Moderate Starch	Low Starch
Milk Income \$/50cows/year	\$237,250	\$179,945
Body Weight Loss Replacement Cost \$/50 cows	\$2,331.50	\$2,671
Ration Cost \$/50 cows/year	\$111,690	\$98,185
Total Income Over Feed Costs \$/50 cows/year	\$123,228.50	\$79,089
Total Income Over Feed Costs \$/cow/year	\$2,464.57	\$1,581.78
\$ Advantage/cow/year	\$882.79	