

Phosphorous is required in the dairy cow diet for bone remineralization or growth, milk secretion, fatty acid transport and nutrient synthesis. Furthermore, think back to your high school biology classes where you taught all about the mitochondria being the power house of the cell and the role of ATP in energetic processes. The abbreviation ‘ATP’ stands for adenosine tri**phosphate**, which means that phosphorus has a huge role in energy transactions. Rumen microorganisms also require phosphorus for cellulose digestion. Needless to say, adequate levels of phosphorus in the diet is important for cow health and performance; however, over feeding can have negative environmental impact. Phosphorus deficiencies are common in cattle grazing on phosphorus deficient soils, or cattle consuming excessively mature forages. It becomes difficult to determine if a cow is phosphorus deficient because the cow will often present with other nutritional deficiencies (such as protein and energy), and because milk phosphorus levels will remain in the normal range despite low blood phosphorus levels. In extreme cases, growing animals will develop rickets disease, however this is very uncommon and is the result of extreme deficiencies. On the other hand, over feeding phosphorus is not only a poor economical strategy, but it also can result in excessive phosphorus being excreted in the manure and ending up on the fields. Despite some claims that increased phosphorus can promote reproductive success, the research does not support these claims and actually reports no apparent benefit of providing excessive phosphorus to cows. The results of several studies reported that phosphorus in the range of 0.32 to 0.42 is sufficient to meet the cows needs throughout her entire lactation. Below is a chart taken from Utah State University Extension that provides a good visual representation of the result of providing excessive phosphorus levels. In most cases, dietary supplementation is not needed and the phosphorus from feed ingredients and salivary action is sufficient to meet the cow’s needs – this is good news since phosphorus is one of the most expensive mineral elements! That being said, one consideration for these recommendations, is to think about the bioavailability of the phosphorus. The cow’s ability to absorb phosphorus is dependent on the feed source and unfortunately, we can’t assign one value to all feeds. It’s also important to note that salivary phosphorus supplies more phosphorus to the small intestine than dietary phosphorus – which means that ensuring healthy chewing and rumination behaviors is a very easy and cost-effective strategy to providing adequate phosphorus to the cow. Overall, phosphorus is an essential mineral for health and performance, but careful consideration is needed to ensure excessive levels aren’t being provided.

Table 4. Fecal excretion of P with different dietary P levels (modified from Powell and Satter, 2008).

Amount of P fed and excreted by one lactating cow producing 20,000 lbs milk in 305 days, and the amount of land required to effectively use manure P.			
Dietary P	Manure P	Land area needed to recycle manure P	Increase in land area needed
%	(lbs/lactation)	(acres)	%
0.35	34.8	1.3	Base
0.40	42.3	1.6	23
0.48	54.5	2.0	53
0.55	60.0	2.4	83

Source: Utah State University Cooperative Extension. 2010. Phosphorus in dairy cattle diets.