



Effect of Stover Removal/Silage Harvest on Nutrients in the Following Year

How are corn stover harvest and corn silage harvest related to nutrient removal?

Harvested cornstalk residue (corn stover) after grain harvest can be used as bedding and an additional food source for livestock. Interest in corn stover has also been increasing for other uses, such as for energy production as cellulosic ethanol. While corn silage harvest has been practiced for many years, and nutrient removal with silage is well known, corn stover harvest and related nutrient removal are different due to the later timing of harvest.

How does timing play a role in corn harvesting for silage?

The best time for harvesting corn for silage is when the kernels are well dented, the moisture content of the corn plant is between 65-70%, which equals 30-40% of dry matter (DM), and leaves have not turned brown. The quantity and quality of the silage are at a peak during this time. Substantial seepage and storage losses often occur with silage containing 75% moisture content or more.

What is the relationship between DM and nutrients in corn silage?

Nutrients in corn silage are directly related to the percentage of DM, which is why the proper timing of silage harvest is critical. Digestibility and metabolizable energy can be influenced by the corn growth stage at harvest. If ensiling is delayed, animal digestibility and weight gain can be diminished. Silage harvested too dry or mature can have harder kernels, which contain more starch instead of desirable sugars and digestible fiber.

Does silage removal have any effect on soil fertility for the next cropping season?

The removal of corn for silage can have a negative effect on soil fertility and soil moisture conservation. Because a significant amount of biomass is removed when corn is harvested as silage, several times more nitrogen (N), phosphorus (P), and potassium (K) is removed than would be if the crop was harvested for grain. Without the crop residue cover, more soil moisture can be lost due to evaporation. Producers shouldn't lose sight of the consequences of nutrient removal and plan to replace lost nutrients prior to seeding the next crop, particularly for crops with high K requirements (alfalfa).

Is there data to support the nutrient removal in corn silage?

There are published average values for silage nutrient content; Iowa State University Extension publication PM 1688 lists the P and K content per ton of corn silage at 65% moisture as 3.5 lb P_2O_5 and 8.0 lb K_2O . On a DM basis, these values are 10 lb P_2O_5 and 23 lb K_2O . These estimates can be used to calculate the removal of P and K based on the amount of silage harvested. The amount of P and K removed with corn silage compared to grain differs because the relative amounts of these nutrients are different in vegetative parts vs. grains. There can be approximately four times more P per ton of dry matter in grain than in vegetative parts, but for K the opposite occurs, on average with almost three times more K per ton of dry matter in the vegetative parts than in grain. Over the years, P and K have been of greatest concern with silage harvest due to the large removal amounts, with less attention on N or other nutrients. This is changing as more focus is being placed on C and N due to effects on sustainability of the soil resource with silage and stover harvest, and the effects of N on water quality.

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// What is the nutrient composition of corn stover?

Determining the nutrient content of corn stover is complicated because nutrients, especially K, can be leached out of plant tissue from maturity to grain harvest, and after grain harvest. This means that nutrient concentrations of stover can be quite different depending on the rainfall pattern from plant maturity to the time of stover harvest.

// What should you consider regarding nutrient management after stover harvest?

Long-term management, including soil testing for P and K, will determine if nutrient removal is being correctly accounted for with stover harvest. Management of N with stover harvest is not straightforward as there is not a direct relationship between stover removal and the need for additional N application in subsequent corn crops. In recent research a small reduction in the needed N fertilization rate for continuous corn was found as a result of less corn biomass returned to the soil with partial stover harvest. It is difficult to retain N in soils and simply adding more N to replace what was removed in harvested stover will not add directly to soil organic-N and could increase nitrate losses to drainage water.

References:

Moriera, V.R. 2008. Corn silage management for lactating cows. Louisiana State University Agriculture Center. <https://www.lsuagcenter.com/NR/rdonlyres/FF26F86D-9EA5-49A5-9745-3E6BCCAD36B5/49045/Cornsilagemanagement.pdf>.

Sawyer, J.E. and Mallarino, A.P. 2012. Nutrient Considerations with Corn Stover Harvest. 2012 Integrated Crop Management Conference- Iowa State University-131. PM 3052C, Iowa State University Extension, <https://store.extension.iastate.edu/product/Nutrient-Considerations-with-Corn-Stover-Harvest>.

Websites verified 9/25/2019

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