ESTIMATING LOSSES WHEN CORNSTALK FIELDS ARE ACCIDENTALLY BURNT

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In some dry fall and winter periods, fires can move accidentally into cornstalk fields. Regis Voss, Iowa State University soil fertility extension specialist (now deceased), wrote an article for the May 14, 1993 ICM Newsletter on mineral element losses when cornstalks burn. Following is that article. Much of the information in the article is still relevant today. Additional considerations are also provided following the article, including explanation of changes from the original article, like nitrogen (N) concentration of corn vegetation and sulfur (S).

"What is lost? The mineral elements such as phosphorus and potassium will be in the ashes. Most of the nitrogen can be lost and you can assign a dollar value to this loss. How much nitrogen is lost? You can base an estimate on some assumptions. In the mid-range of corn yields, the dry matter weight of stalks, leaves, and so on, is approximately equal to the dry matter weight of grain. The only measure available is some estimate of corn grain yield. The nitrogen concentration in corn plant residue without the grain is about one percent.

"An example is 140-bushel corn grain yield. Take 140 × 56 to equal 7, 840 pounds. Take 7,840 × 0.845 to equal 6,625 pounds. (This has corrected the plant residue to a dry matter basis because the grain yield was a 56-pound bushel at 15.5 percent moisture.) Take 6,625 × 1 percent N to equal 66 pounds of nitrogen. Assign some price per pound of nitrogen and this would be the estimated value lost.

"You may wish to assign a value for loss of organic matter. The effect on organic matter of removing all crop residue versus leaving it for a one-year period cannot be detected in an organic matter analysis. By using some standard values for what ends up in the soil organic matter, the addition of the above example of 6,625 pounds of cornstalk residue would increase soil organic matter by 0.056 percent. There are no assigned dollar values for organic matter, but we know it has some value. We usually suggest a dollar an acre for this loss."

A few additional considerations. The estimate of N loss can be adjusted up or down for yields higher or lower than the example calculation in the 1993 article. Also, the N concentration of cornstalks is less now than with the data used in the 1993 article (approximately 0.6 percent N, dry matter based). Yield level effects are easily accounted for from the assumptions that cornstalk residue contains approximately 0.6 percent N and that the residue amount is approximately equal to the grain dry matter produced. This approach will not be exact, but will provide a reasonable estimate for production fields with adequate fertility.

If a burnt field is in a corn–soybean rotation, then it is likely that the N loss would not have a significant influence on the subsequent soybean crop. The N lost essentially is not important for the soybean crop because soybean symbiotically fix N and can compensate for less plant-available soil derived inorganic-N.

Sulfur (S) contained in the cornstalk residue will be affected in the same manner as N. The amount in cornstalk dry matter would be approximately 1.3 lb S/ton. With the current need for S fertilization in many fields, loss of S for recycling to soil could affect future crop response and need for S fertilization. The S equivalent value can be determined from S fertilizer price.

Assigning a value to lost organic matter is difficult. There are no universally assigned values for crop residue or soil organic matter. And compared with organic matter levels in soils, the amount that would normally remain after residue decomposition from one corn crop is very small (long term, much less than 10 percent of carbon in crop residue will remain as soil organic matter). With carbon trading, cornstalk consumption for energy production, and cornstalk bedding/co-feeding for animal production, cornstalk values can be obtained to estimate organic matter value. Loss of surface residue may be a short-term issue for erosion control.

We know from laboratory procedures that dry ashing at high temperatures is an accepted method for determination of many mineral elements, such as phosphorus (P) and potassium (K). Therefore, these elements will remain in the ash. If ash is blown from the field, then losses would occur (someone else will ultimately benefit when the ash reaches the ground). It would be difficult, however, to determine the extent of this loss. Also, weathering (due to rainfall) of the cornstalk residue would normally cause much of the K, and some N and P, to be moved out of the residue and into the soil where it is not subject to off-field loss.