CROP RESIDUE MANAGEMENT: TRASH OR TREASURE?

Francisco J. Arriaga [1/]

Crop residues provide several benefits to the soil and crop production systems. Minerals and nutrients in crop tissue are released as residue decomposes, aiding in the recycling and better utilization of nutrients by subsequent crops. During decomposition, carbon in the residue is transformed into different soil organic matter forms. These different fractions of soil organic matter play important roles in soil fertility, soil water relations, and soil biology.

Management of crop residues is of importance for various reasons, including nutrient recycling, soil carbon build-up, erosion prevention, soil temperature and moisture regulation, and equipment interference, among others. The relative importance of these factors depends on the goals in mind, type of residue, crop in a rotation, climate, and soil type. For this reason, it is difficult to generalize crop residue management practices. However, a universal benefit of crop residues is their value on reducing soil erosion. Residues left on the soil surface help protect soil particles from raindrop impact and detachment, which eventually leads to erosion. Additionally, reducing soil particle detachment also helps in decreasing crust and surface seal formation, both of which hinder seed germination and water infiltration. Surface residue cover of 30% or greater can reduce erosion by 50% or more, with greater amounts of residue cover having a larger impact. Further, residues on the soil surface can help reduce crop water use by acting as a mulch and reduce plant canopy temperature during hot periods of the growing season. One concern with residues on the soil surface is slower warm-up of the soil in the spring and sluggish early plant growth, but typically as the crop develops and air temperatures increase as the growing season progresses, crop development catches up.

It is important to note that residue management should begin at harvest and continue with other field operations. Residue spreaders on combines should distribute residue biomass evenly across the field to avoid uneven emergence and planter interferences the following planting season. Additionally, newer headers have capabilities to chop and size residue, which can be beneficial for aiding decomposition and better residue mass flow through planting and tillage equipment.

While some tillage can help size and incorporate crop residues, excessive tillage will bury a great portion of the residue leaving the soil surface bare. Excessive or aggressive tillage can create crust issues, destroy soil aggregation, and inhibit water infiltration and redistribution within the soil profile. On the other hand, proper tillage will leave enough residue cover on the soil surface to create a good seedbed. In some situations, no-tillage or direct seeding might be an option. It has been noted that decaying root systems and stalks that are partially buried can create pathways for water to flow more freely into the soil, which enhances recharge of the soil profile. Although strict no-tillage might not be practical in some conditions, it might be possible to manage crop residues on a rotational basis depending on the crop phase. In this manner, overall disruption of soil aggregates is reduced on a longer time period (for example, tilling after corn only in a corn-soybean-wheat rotation) while a proper seedbed is created and high residue amount concerns are addressed after crops such as corn.

[1/] Assistant Professor and Extension Soils Specialist, Dept. of Soil Science, 1525 Observatory Dr., Univ. of Wisconsin-Madison, Madison, WI 53706.

Crop residues are beneficial to the overall function of plant and soil systems in crop production. Although issues can arise when not properly managed, crop residues are valuable for crop productivity as they help build-up soil. As such, plant residues are resources and should not be treated as a waste material.