Short and Long Term Impacts of Burning Crop Residue

This has been an extraordinary season for raising wheat, barley and oats in Cache County. On most farms yields have been exceptional on both irrigated and drylands. In most cases, bushel weights have been respectable too. Growers were able to plant weeks earlier than normal, and the copious spring rains in May really got small grains off to a good start. About the only down-side some growers experienced was lodging. Heavy grain heads were more than stiff straws could hold up. As such some grain tipped over making it difficult to combine.

Not only did we enjoy heavy grain yields, but we now have an abundance of straw, more straw than we know what to do with. Some straw is used for bedding and some for feed, but we have more straw than we can sell and adequate storage is difficult to find. A common question we get at the Extension office has to do with the wisdom of burning the large windrows and grain stubble. A timely USU Extension Fact sheet, co-authored by Dr. Grant Cardon, Lyle Holmgren and Clint Hill answer that question. The remainder of this column is a summary of their Fact sheet.

For several decades farmers have burned stubble, CRP lands and rangelands as an inexpensive and effective way of controlling weeds, insects, diseases and excess crop residue. Black grass bugs, for example, can be partially controlled with a timely burning late in the season. Prescribed burnings can also help prevent catastrophic fires by reducing fuel loads. Ease of tillage, seeding and other field operations can be enhanced by burning excess crop residue. More stringent government regulations make burning stubble or other crop residue less likely.

We typically discourage burning because adequate crop residue is one of the most important factors for healthy and productive soils. Crop residue can provide a protective layer for soil erosion by wind or water, can increase the organic matter and water holding capacity of the soil, and can provide “feed and forage” for earth worms. When crop residue is burned all of those benefits are lost, plus other damage may be done.

More than 30 years of research has shown that, although there may be some short-term benefits to burning crop residue, there is a slow and steady reduction in soil health that will eventually result in reduced productivity that cannot be overcome with increased additions of mineral fertilizers. Long-term soil, chemical and nutrient effects include a significant reduction in total Carbon and Nitrogen pools. An improved C:N ratio under residue retention increases and maintains higher microbial activity, ensuring more rapid organic matter decomposition and nutrient release to the soil. Burning decreases readily assimilated carbon sources for microbes, decreases soil ammonium levels and available soil phosphorus. That’s to say nothing of increased erodibility, lower organic matter levels and reduced water intake and retention.

A general review of the literature indicates that no measurable negative effects are associated with occasional and short-term burning, but that prolonged burning (>15 years) results in a significant loss of soil health and function. What may, at first, be attractive as short-term benefits, eventually become long-term cost increases in soil nutrient and crop production management. The costs associated with the loss of organic matter and nutrients from burning crop residue exceed its benefits.

The USDA- NRCS office promotes sound conservation practices to help make those transitions from burning residue to leaving residue. Practices such as residue management no till, mulching, cover crops, conservation crop rotation, and many other practices are all alternative to burning. The NRCS provides technical and financial assistance to landowners to help with these and many other types of projects. Farm Bill Programs such as the Environmental Quality Incentives Program (EQIP) and the Conservation Stewardship Program (CSP) can help implement some of these conservation practices. Growers can contact their local NRCS office to learn more about improving soil health.

Clark Israelsen
USU Extension Ag Agent
Cache County

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