Herbicide resistance has been a rapidly growing issue in agroecosystems worldwide. Resistance issues can develop fairly quickly in weeds after a repeated use of the same herbicide or a similar herbicide with the same target site in the plant. The first case of herbicide resistance was in 1968 with triazine-resistant weeds; by 1991, there were 120 weed biotypes resistant to triazine herbicides and resistance issues with 15 other herbicide families as well (3). With such rapid resistance development, growers need to pay close attention to how frequently the same herbicide is being used. With stacked-trait technology being used in crops, growers are becoming more dependent on just a few herbicides but need to consider the resistance issue prior to getting comfortable with the same application year after year. Today, there are many management practices that can be implemented to combat resistance issues.

The best option for combating resistant weeds is to use herbicides that target a different site of action within the weed. A site of action is where the herbicide binds within the plant to disrupt physiological processes within the weeds. If you use herbicides that bind to the same site of action, resistance issues could develop. According to Jeff Gunsolus, extension agronomist at the University of Minnesota, “A change in a site of action that results in resistance to a particular herbicide may or may not result in resistance to other herbicides that are active at the same site of action. The reason for this is there can be many different binding sites at a particular site of action, and those binding sites can be very herbicide specific” (3). Weeds will develop resistance to some herbicide groups much faster than others.

ALS inhibitors and triazines (photosystem II disruptors) are among the faster modes of action that weeds will develop resistance to. As stated above, with new herbicide-resistant crops, growers will need to pay careful attention to still rotate herbicides in order to continually combat resistant weed populations. With crops being tolerant of compounds like glyphosate that provide non-selective weed control, it becomes easy to fall into the habit of using glyphosate year after year. Glyphosate-resistant weeds are now found worldwide, and I think the rapid increase can be attributed to the use of herbicide-resistant crops. Stacked-trait crops with resistance to multiple herbicides should help farmers rotate herbicides and not depend so heavily on glyphosate usage.

Even with the heavy dependence on glyphosate, using a short residual herbicide will help control potentially glyphosate-resistant weed seeds that have contaminated the field over the years. Having a short residual herbicide applied to a field will provide weed control during the critical emergence period before planting. “Using herbicides that do not persist in the soil for long periods and are not applied repeatedly within a growing season reduces the selection of herbicide-resistant weeds,” writes Carol Mallory-Smith, professor of weed science at Oregon State University. “However, repeated applications within a growing season of a herbicide with no soil activity (e.g., Gramoxone) has resulted in weeds resistant to the herbicide” (4).

While paying attention to the mode of action of the herbicide, you must also be sure to follow the recommendations on the label for use rates. Often times, the use rate will depend on the soil type or the organic matter content of the soil. Using rates well over the recommended rate is not only illegal, but also can speed up herbicide resistance in weeds as the strongly resistant biotypes will not be controlled and will add the highly resistant seed to the field’s seed bank. On the other end, if growers begin to use under the recommended use rates, then metabolic herbicide resistance can develop within the weeds over time. As you apply rates that may not control the weeds, the plants can build up a tolerance or learn to metabolize...