

Glyphosate and Herbicide Tolerant Crops: Key Factors for On-Farm Sustainability

Event

In recent decades, Saskatchewan farmers have adopted more environmentally friendly crop production practices such as conservation tillage and continuous cropping that have replaced frequent soil tillage and summerfallow practices. These adoptions have reduced net greenhouse gas (GHG) emissions from the soil through reduced disturbance and increased carbon sequestration. Numerous technologies facilitated these adoptions, such as improvements in-crop input technologies and farm equipment. However, two technologies, in particular, are driving farmers' ability to make sustainable on-farm management changes, the use of glyphosate for ongoing, efficient weed control and genetically modified, herbicide tolerant (GMHT) crops.

Significance

The adoption of sustainable land management practices has contributed to improved agricultural carbon sequestration. The challenge is that farmers' contributions are not often included in environmental policy discussions. The contribution of beneficial technologies, such as GMHT crops and glyphosate, to sustainable adoptions, are often unrecognized, and in some cases, are outweighed by the hypothetical and speculative risks regarding their use. Farmers' continued use of important technologies requires communication with the public and policy makers regarding how these technologies contribute to on-farm environmental sustainability.

Analysis

One hundred and twenty-seven Saskatchewan farmers were surveyed between November 2020 and March 2021, on changes in land management practices and the role played by various technologies in facilitating these changes. When asked on a scale of 1-10, with 10 being the most significant, how various technologies facilitated farmers' ability to reduce tillage and summerfallow practices, glyphosate scored 9 out of 10 (n=117). Comparatively, GMHT canola's value was 7.3 (n=116), while other HT crops (GM and mutagenic derived) scored 5.3 (n=109). Glyphosate is the technology driving zero-tillage (ZT) adoption due to its flexibility and efficiency in pre-seed and post-harvest applications, as well as in GMHT crops. Results indicate that, in Saskatchewan, GMHT canola is a key factor in farmers' abilities to make sustainable management changes.

When asked if their operation would change in the absence of GMHT crops and glyphosate, it was noted that if glyphosate were no longer available (n=115) it would increase tillage (54%), decrease yield and profitability (37%), result in the use of other, less environmentally benign chemicals (23%), and reversion to summerfallow (14%). Commonly noted changes if HT crops were no longer available (n=107) include changes in chemical use (30%), decreases in yield and profitability (28%), changes in crop rotation (21%), as well as increases in tillage (20%) and summerfallow (11%). When asked what percentage of their land would include summerfallow in the absence of HT crops, the average response (n=104) was 23%. Compared to the 1% of land currently managed with summerfallow within the survey sample, this represents a step backwards in farmers' sustainable soil management if HT crops were no longer available.

Survey results show that between 1991-94 (n=64) and 2016-19 (n=126), summerfallow decreased from 44% of hectares to 1%, while minimum-tillage increased from 35% to 42% of hectares and ZT increased from 14% to 55% of hectares. Saskatchewan farmers' reductions in tillage and summerfallow have resulted in improved carbon sequestration in agricultural soils. Carbon accounting results show that between 1991-94 and 2016-19, annual carbon sequestration increased by 0.14 tonnes/hectare from reductions in tillage and by 0.39 tonnes/hectare from reductions in summerfallow. As indicated by participants' responses, these improvements in carbon sequestration would likely not have occurred to the same extent or been maintained, without the continued use of glyphosate and GMHT crops, especially canola.

Conclusion

Innovative technologies, including glyphosate and GMHT crops, provide Saskatchewan crop farmers with the opportunity to reduce tillage and summerfallow through more effective and efficient in-crop weed control, leading to improved soil carbon sequestration. Without the use of these technologies, particularly glyphosate, the sustainability of Saskatchewan grain farms would likely not have progressed to where it is today.