Sustainability of Dryland Malt Barley Production and Quality

The Northern Great Plains, a region with cool climate and lower precipitation compared with other regions, is a leading producer of malt barley in the world. The strict requirements of malt barley grains with low protein content (<13 and 13.5% for two- and six-row malt barley, respectively) and large, plump kernels (>80%) for malting grade, however, present unique challenges for producers. As a result, only 25% of malt barley is accepted for malting purpose, with the rest being used for livestock feed, thereby resulting in lower revenue for producers.

Previous studies have focused on the effects of nitrogen rates and cultivars on malt barley yield and quality, but little is known about the responses of tillage and crop rotation on dryland malt barley production. Increased nitrogen fertilization rates usually increase malt barley grain yield and protein concentration but reduce kernel plumpness. Increased nitrogen rates also reduce environmental quality by increasing the potentials for nitrogen leaching and nitrous oxide emissions, a potent greenhouse gas. Conventional dryland farming practices include malt barley–fallow to conserve soil water and sustain grain yield, but the practice is uneconomical and unsustainable due to reduced annualized yield and soil quality. Since nitrogen fertilization and management is extremely sensitive to maintain malt barley grain yield and quality, practices that reduce tillage intensity and nitrogen rate, eliminate fallow, and increase crop diversity are needed not only to reduce production costs and increase yield and quality, but also to improve soil and environmental quality.

In the March–April 2013 issue of Agronomy Journal, a team of scientists from USDA-ARS, Sidney, MT evaluated the effects of a combination of tillage (no-till and conventional till), cropping sequence (malt barley–pea, malt barley–fallow, and continuous malt barley), and nitrogen fertilization rates (0, 40, 80, and 120 kg N ha⁻¹) on malt barley yield and quality (kernel plumpness and grain protein content). doi:10.2134/csa2013-58-5-3