

Best Management Practices to Control Blowing Dust in the World's Driest Rainfed Wheat Region

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The Horse Heaven Hills (HHH) located in south-central Washington in the Pacific Northwest of the USA contains the world's driest rainfed wheat (*Triticum aestivum* L.) production region where farms receive as little as 150 mm average annual precipitation. Late summer establishment of winter wheat into carryover seed-zone moisture after a year of fallow is essential to achieve the highest grain yield potential. Tillage of fallow land during the spring is considered necessary to retain adequate seed-zone water during the dry summer months, but blowing dust from excessively-tilled fallow is a major safety, environmental, and soil-quality concern. We conducted a 5-yr study to compare three fallow management systems on two farms in western and eastern portions of the HHH where long-term annual precipitation averages 153 and 211 mm, respectively. Fallow management treatments were: (i) traditional tillage (TTF), undercutter conservation tillage (UTF), and no-tillage (NTF). Late-summer planting of winter wheat in TTF and UTF was possible in only one year of five at the Western site due to lack of adequate seed-zone moisture whereas late-summer planting was possible every year at the Eastern site. There were no significant differences in net economic returns among fallow management treatments at the Western site; however, net returns per hectare averaged a positive \$101 for TTF and UTF versus a negative -\$92 for NTF at the Eastern site. Although seed-zone water in late summer was consistently lowest with NTF at both sites, we recommend NTF for farmers in the Western HHH because achieving adequate seed-zone water for early wheat establishment is generally not possible with any fallow management practice and NTF is excellent for wind erosion control. On the other hand, in the Eastern HHH, where adequate seed-zone water for early planting can be achieved with tillage essentially every year, farmers should practice UTF. This study documented that NTF in the Western HHH and UTF in the Eastern HHH are best management practice for farmers and the environment in a region where wind erosion from excessively tilled soils is a severe problem.