

## Comparison of site-specific, whole field and seedbank physical weed control treatments

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**Summary** Herbicides are the dominant weed control method in grain production systems due to their high efficacy, reliability and low cost. Yet their ongoing use is threatened by herbicide-resistance, fewer herbicide discovery programs, and increasing regulation. Thus, there is a need and considerable interest in the use of physical methods for weed control. There are a wide range of highly effective physical weed control approaches that can potentially be used in cropping systems. The many physical weed control technologies developed over the last 50 years have been reviewed and compared according to their energy requirements for effective weed control. Physical weed control methods have been divided into four groups, broadcast (whole paddock), intra-row, site-specific and below ground (seed) control, in accordance with application method. In general, site-specific weed

control approaches (0.005–11.5 MJ ha<sup>-1</sup>) were orders of magnitude more energy efficient than broadcast thermal (1000–75,000 MJ ha<sup>-1</sup>), broadcast tillage (2.5–75 MJ ha<sup>-1</sup>) and below ground treatments (24–280 GJ ha<sup>-1</sup>). The most energy efficient site-specific approaches included forms of electrocution, laser pyrolysis and hoeing. For broadcast weed control, cultivation techniques are the most energy efficient, over broadcast thermal systems. However, for no-till farming operations, steaming, infrared, and inter-row flame weeding were found to be the most efficient. Seedbank targeting, while very energy expensive, creates an opportunity for maximum weed control with microwave treatment on smoothed soil the most suitable technique for this approach.

**Keywords** Site-specific weed control, physical weed control, energy requirements.