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No-tillage method of weed management reduces weed density and diversity

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A multi-site field study on organic vegetable farms across five European countries assessed the efficacy of a no-till approach to weed management. An in-line tillage/roller crimper machine (ILRC) was used to flatten a non-food crop, known as an agroecological service crop (ASC), and to create a narrow furrow in which to plant organic vegetables. Case studies have shown ILRC methods to reduce weed abundance, and this larger-scale study sought to determine if this is the case for different crops and climates across Europe.

At present, ASCs are usually tilled back into the soil in Europe to act as green manure (GM) and help with weed management. However, as tilling lowers soil quality, the European Environment Action Programme[1] encourages Member States to try to increase soil organic matter via sustainable farming methods, including no- or low-till techniques. Research in Italy using an ILRC has shown that it lowers the number of weeds in melon and courgette crops — without tilling the soil. However, there is currently no research examining the effect of the ILRC method on weed assemblage (the number of species and abundance of weeds in different crops and soils) on European organic vegetable farms.

This study compared ASC management via ILRC versus GM in a range of field settings, to see which most affected weed abundance, species richness and community composition during the early stages of crop growth.

The researchers carried out seven field experiments comparing GM and ILRC management of weeds over two years in five countries across different climatic regions in Europe, providing 14 datasets. The GM approach had three steps: chopping the ASCs back, tilling this material into the soil when dry, and preparing seed beds. The ILRC approach requires two steps: flattening the ASCs using several rapid passes of the roller crimper, and then more slowly using an ILRC to create a planting furrow. A specific statistical model was applied to each

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individual field trial, and data then subsequently analysed across all trials to see if the use of an ILRC had a common effect on weed density and species richness. All of the trials were organically managed.

Compared to GM, ILRC management reduced weed density by an average of 35.1% and weed species diversity by 23.8% across the trials. The effects of the ILRC technology were found to be strongly affected by cropping conditions (inter-annual weather conditions, field differences) but, overall, the study suggests that ILRC weed management may be effective at reducing weed density in the early stages of crop growth.

These findings highlight the potential of the ILRC as a low-tillage weed management approach for organic vegetable growers across Europe. This would enable EU Member States to move towards more sustainable farming practices by reducing ploughing, saving energy and preserving soil stocks of organic matter. However, as this study only focused on a short-term transition to ILRC, the researchers suggest that further longer-term impacts are examined — such as the effect of mulch on soil conditions — before it is considered as a long-term ASC management strategy. They also note the need for longer-term case studies that account for changing cropping conditions and encompass the entire crop growing cycle.

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1. General Union Environment Action Programme to 2020 'Living well, within the limits of our planet': https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32013D1386