Special topic 4

Tillage: how bad is it in organic agriculture?

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Introduction

Soil tillage is often perceived to exert negative effects on organic farming systems. This perception likely stems from the consideration that tillage can deteriorate soil structure, disrupt ecological niches for soil biota (e.g. earthworms and vesicular-arbuscular mycorrhizae) that have positive ecological functions in agroecosystems, enhance soil organic matter (SOM) mineralisation and impair SOM build up, increase risks of nutrient losses to the environment and of soil erosion and ultimately contribute to soil fertility loss and soil quality degradation. However, it would be incorrect to claim that soil tillage *per se* is the cause of these negative effects. Indeed, such effects are more appropriately associated with repeatedly wrong technology application, such as the blanket use of deep mouldboard ploughing regardless of crop and environmental context, as it has been the typical long-term situation in conventional systems, like continuous wheat cropping in Southern Europe (Bàrberi and Lo Cascio 2001).

As the negative effects of tillage are often associated with conventional agriculture, and as one of the main goals of organic agriculture is to counteract and/or prevent negative aspects related to conventional systems management, it would seem logical to always associate organic systems management with tillage reduction. The aim of this chapter is to challenge this dogma through a reasoned analysis of the pros and cons of tillage in organic agriculture based on the rather scant scientific literature available, and underlining the need to conceptualise tillage management in a cropping system and environmental context. Lastly, differences between the expected effects of tillage management in conventional and organic systems will be discussed.

When tillage is important in organic agriculture

Organic systems rely on the application of organic amendments, green manures and other organic matter sources with the dual purpose of:

1 building up soil fertility through an increase in SOM quantity and quality; and
2 supplying adequate amounts of nutrients, especially nitrogen (N), to sustain crop growth and productivity.

This indirect approach to crop fertilisation, which clearly reflects the preventive, long-term nature of agronomic recommendations set forth in organic systems (IFOAM 2005), increases