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Impact of crop residues localization on soil organic carbon sequestration

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No-tillage for conservation agriculture (CA) changes the patterns of crop residues decay, its subsequent input and localization across different soil layers. The main objective of this study is to determine the organic carbon flux when wheat residues are left on soil surface (RSS) under CA versus incorporated residues in the soil (IRS) under conventional agriculture (CovA). Experiment was run under laboratory controlled conditions and RSS and IRS refer to CA and ConvA, respectively. Particulate organic matter, C-CO_2 and resistant organic carbon were monitored during three months of incubation at 28°C. The Roth-C model (www.rothamsted.ac.uk) was used to simulate the long-term evolution of different organic pools of data obtained during incubation.
Results showed a larger (+26%) amount of the particulate organic matter with RSS compared to IRS. The C-CO_2 evolved from soil under the former treatment was 20% less then what came out of RIS. The Roth-C model, optimized via the curve measuring C-CO_2 during incubations, and develop a good simulation of labile and resistant soil organic carbon pool evolution with a RMSE of 9-17%.
However, the Roth-C model was used also to predict the evolution of organic carbon in soil for two long experiments located in North-Tunisia with a relative success, supporting that some modifications in the Roth-C parameters are needed to validate its use in the context of CA where considerable changes of crop residues localization and decay take place compared with CovA based on tillage.

Key words: Conservation agriculture, Conventional agriculture, residues decay,
organic carbon, soil incubation.