

Impact of organic and conventional management and tillage operations on soil quality and productivity in the Montepaldi Long-Term Experiment (MoLTE)

L. Ferretti, M. Santoni, T. Gaifami, F. Filindassi, G. Casella, G.C. Pacini

UNIFI-DISPAA Università degli studi di Firenze - Department of Agrifood Production and Environmental Sciences

The authors acknowledge the financial support for this project provided by transnational funding bodies, being partners of the FP7 ERA-net project, CORE Organic Plus, and the co-fund from the European Commission. The text in this report is the sole responsibility of the authors and does not necessarily reflect the views of the national funding bodies having financed this project.

Parameter	Organic						Conventional					
	Plowing		Chisel plowing		Disk harrowing		Plowing		Chisel plowing		Disk harrowing	
	15/16	16/17	15/16	16/17	15/16	16/17	15/16	16/17	15/16	16/17	15/16	16/17
Earthworm abundance [n° 0,05 m ⁻³]	2.17 (bcd)	1.00 (cd)	8.67 (ab)	3.33 (abcd)	9.33 (a)	5.50 (abcd)	0.17 (d)	0.50 (cd)	1.67 (cd)	4.17 (abcd)	3.67 (abcd)	7.00 (abc)
Root density [n° 0,75 m ⁻²]	2131 (a)	-	2052 (a)	-	1947 (a)	-	1818 (a)	-	1535 (a)	-	1746 (a)	-
Spade test [score]	2.22 (ab)	2.69 (a)	2.39 (ab)	2.13 (ab)	2.56 (ab)	2.27 (ab)	2.00 (b)	2.76 (a)	2.11 (ab)	2.11 (ab)	2.73 (a)	2.09 (ab)
Bulk density [g cmc ⁻¹]	1.38 (a)	1.37 (a)	1.43 (a)	1.40 (a)	1.42 (a)	1.35 (a)	1.35 (a)	1.38 (a)	1.38 (a)	1.26 (a)	1.34 (a)	1.35 (a)
Penetrometry [mPa] (0-80 cm)	1.31 (cd)	0.98 (ef)	1.43 (cd)	0.99 (ef)	1.74 (b)	1.02 (ef)	1.35 (cd)	0.87 (f)	1.48 (c)	1.07 (e)	1.94 (a)	1.30 (d)
Org. matter [%]	1.44 (a)	-	1.53 (a)	-	1.56 (a)	-	1.53 (a)	-	1.71 (a)	-	1.75 (a)	-
Available P ₂ O ₅ [mg kg ⁻¹]	11.7 (b)	-	12.8 (b)	-	15.1 (ab)	-	27.5 (ab)	-	28.4 (a)	-	27.8 (a)	-
Total N [g kg ⁻¹]	1.06 (a)	-	1.13 (a)	-	1.13 (a)	-	1.12 (a)	-	1.16 (a)	-	1.21 (a)	-
Barley yield [t ha ⁻¹]	3.65 (abc)	2.94 (bc)	3.31 (bc)	2.31 (c)	3.25 (bc)	2.18 (c)	5.02 (a)	4.47 (ab)	4.96 (a)	4.49 (ab)	4.96 (a)	3.94 (ab)
Sunflower yield [t ha ⁻¹]	2.45 (abc)	1.40 (bc)	2.94 (abc)	1.00 (bc)	1.58 (bc)	1.13 (bc)	4.52 (a)	0.17 (c)	3.35 (ab)	0.17 (c)	2.68 (abc)	0.40 (c)

Main remarks

- **Organic** systems (Or) performed significantly better than **conventional** (Co) as to **earthworms** (2015/16, chisel) and **penetrometry** (harrowing)
- **Or** worse than **Co** as to **available P** and **yields** (except than for sunflower in 2017 due to a extremely severe drought)
- However, an improvement gradient from **Co** (-) to **Or** (+) could be observed regarding **root density** and from **Or** (-) to **Co** (+) regarding **organic matter**
- **Reduced tillage** performed significantly better than **ordinary tillage** as to **earthworms** (2015/16, organic)
- However, an improvement gradient from **ordinary** (-) to **reduced tillage** (+) was observed also regarding **earthworms in conventional** (2015/16 and 2016/17), and organic systems (2016/17), **organic matter**, **P**
- **Ordinary tillage** performed significantly better than **reduced tillage** as to **penetrometry** (2015/16, organic, and both years in conventional).
- However, an improvement gradient from **reduced** (-) to **ordinary tillage** (+) was observed also regarding **root density** (organic) and **yields** (2015/16, organic barley and conventional sunflower)