

# Productivity and sustainability, solving the trade-off of European modern agriculture

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Since a large part of environmental degradations is attributed to farming practices, modern agriculture faces the challenge of keeping its productivity, while becoming more sustainable. For that purpose, this thesis compared conventional farming practices and sustainable alternatives: conventional versus reduced tillage and mineral versus slurry fertilisation. These treatments were analysed on four different wheat cultivars, in a 9-years old long-term trial. Grain yield, thousand kernel weight and grain nitrogen content were investigated as quantitative and qualitative agronomic parameters. Total organic carbon and nitrogen contents, CO<sub>2</sub>-extractable phosphorus and potassium content, microbial carbon and nitrogen contents, alkaline phosphomonoesterase and protease activities were analysed as soil quality parameters. Compared to reduced tillage, conventional tillage resulted in higher grain yields, a similar agronomic quality, but an overall lower soil quality. Grain yield and thousand kernel weight were similar under full mineral and full slurry fertilisations, while grain nitrogen content was higher under full mineral fertilisation. In contrast, the soil quality was globally diminished under full mineral fertilisation, compared to full slurry fertilisation. This outcome demonstrates that, in specific pedo-climatic conditions, some conventional farming practices can be challenged by more sustainable alternatives.

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