

Organic Arable Farming Experiment Gladbacherhof

Productivity and soil parameters of different farm types and various soil tillage systems

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1 Objectives

- Potentials and limits of stockless organic farming:**
 - Direct and long-term impact of different „farm types“ with and without animals on crops, soil quality and the environment.
 - Stability, resilience, sustainability and nutrient efficiency.
- Potentials and limits of reduced tillage in organic farming:**
 - Direct and long-term effects of different tillage systems on crops, soil quality, and the environment.
 - Potentials of reduced tillage with different crop rotation and fertilization.

2 Site description

Location	Gladbacher Hof , 65606 Villmar, Limburg-Weilburg, Hesse, Germany
Altitude	170 m a. s. l.
Mean annual temperature	9,4 °C
Mean annual precipitation	654 mm
Soil texture	Lu – Ul, Silt loam – Loamy silt
Soil type	Orthic luvisol

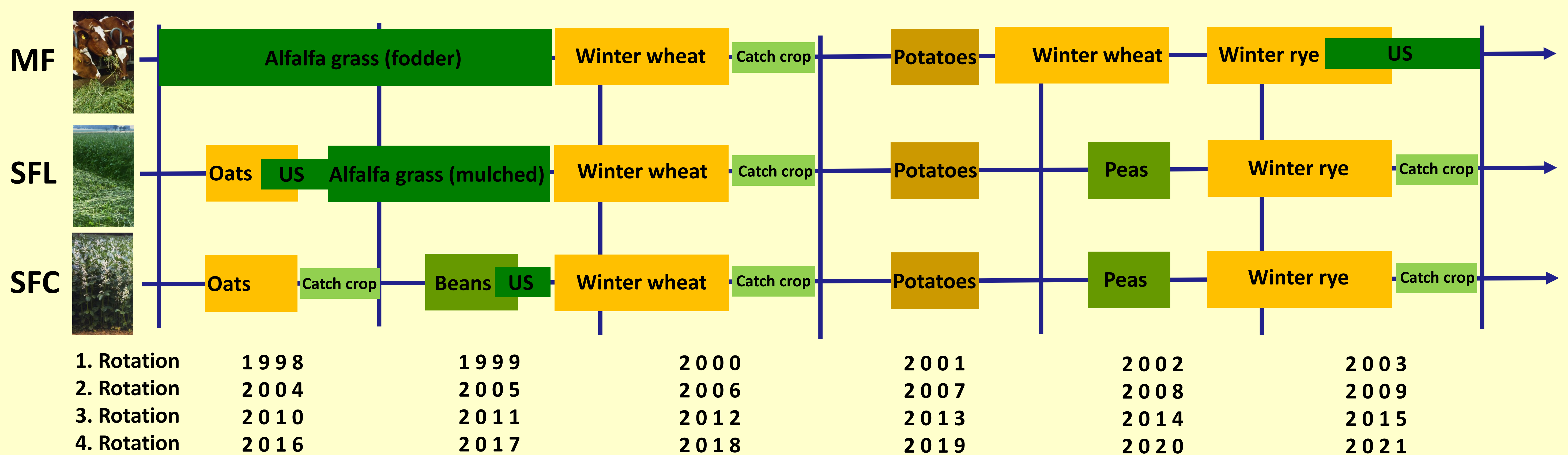
3 Experimental design / treatments

Long-term field experiment since 1998, split-plot design, 4 replications:

a) main factor „farm type“: MF = Mixed farming with cattle
SFL = Stockless farming with mulched ley
SFC = Stockless farming cash crops only

b) subordinated factor „soil tillage“: P 30 = Plough 30 cm
TLP 30/15 = Two layer plough 30/15 cm
P 15 = Plough 15 cm
CR 30/15 = Cultivator & rotary harrow 30/15 cm

Further information: Schulz et al. 2014



4 Some results

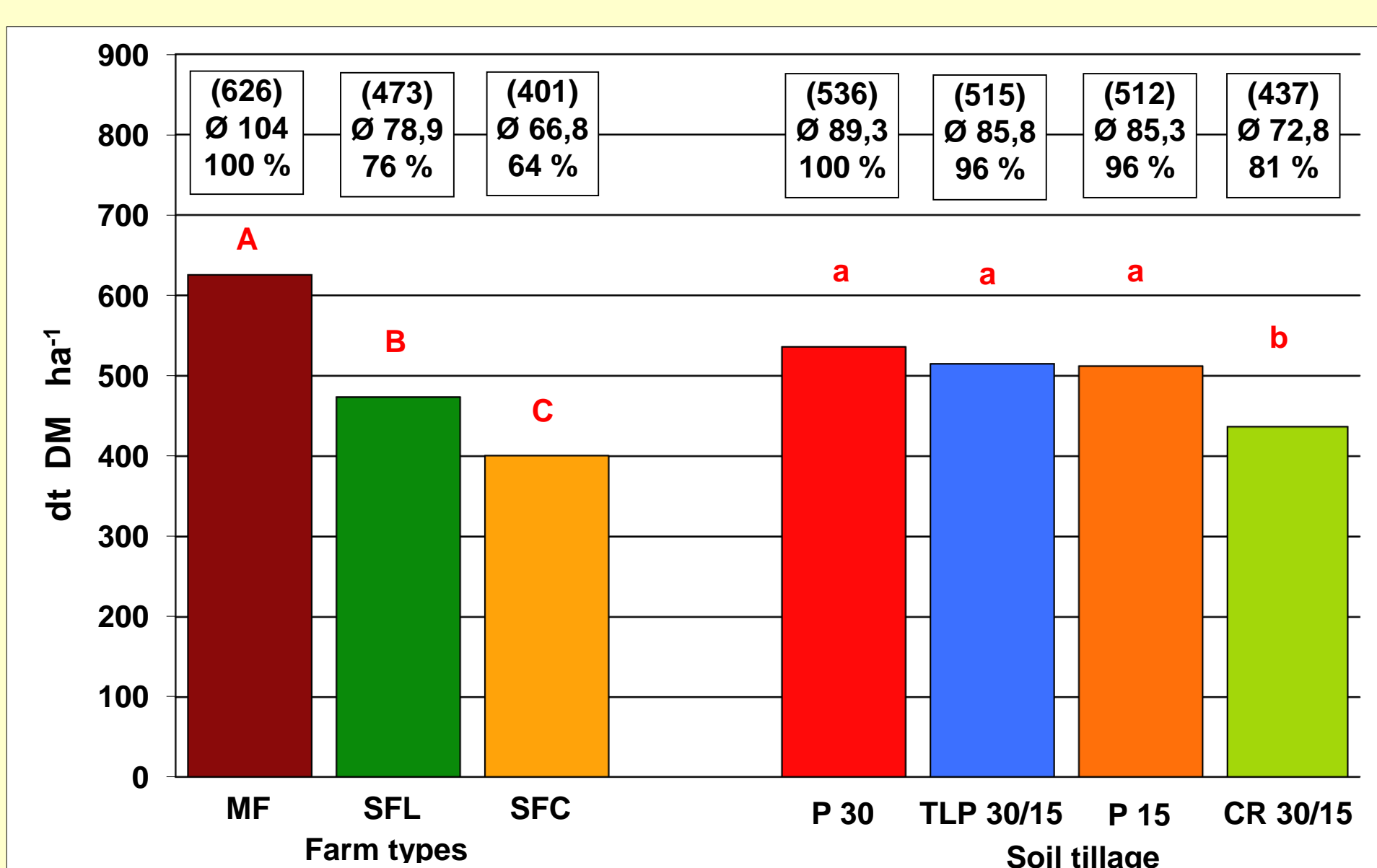


Fig. 1: Total aboveground biomass (dt DM ha⁻¹) in the 3rd rotation (2010 - 2015) dependent on farm type and soil tillage; DM = Dry Matter

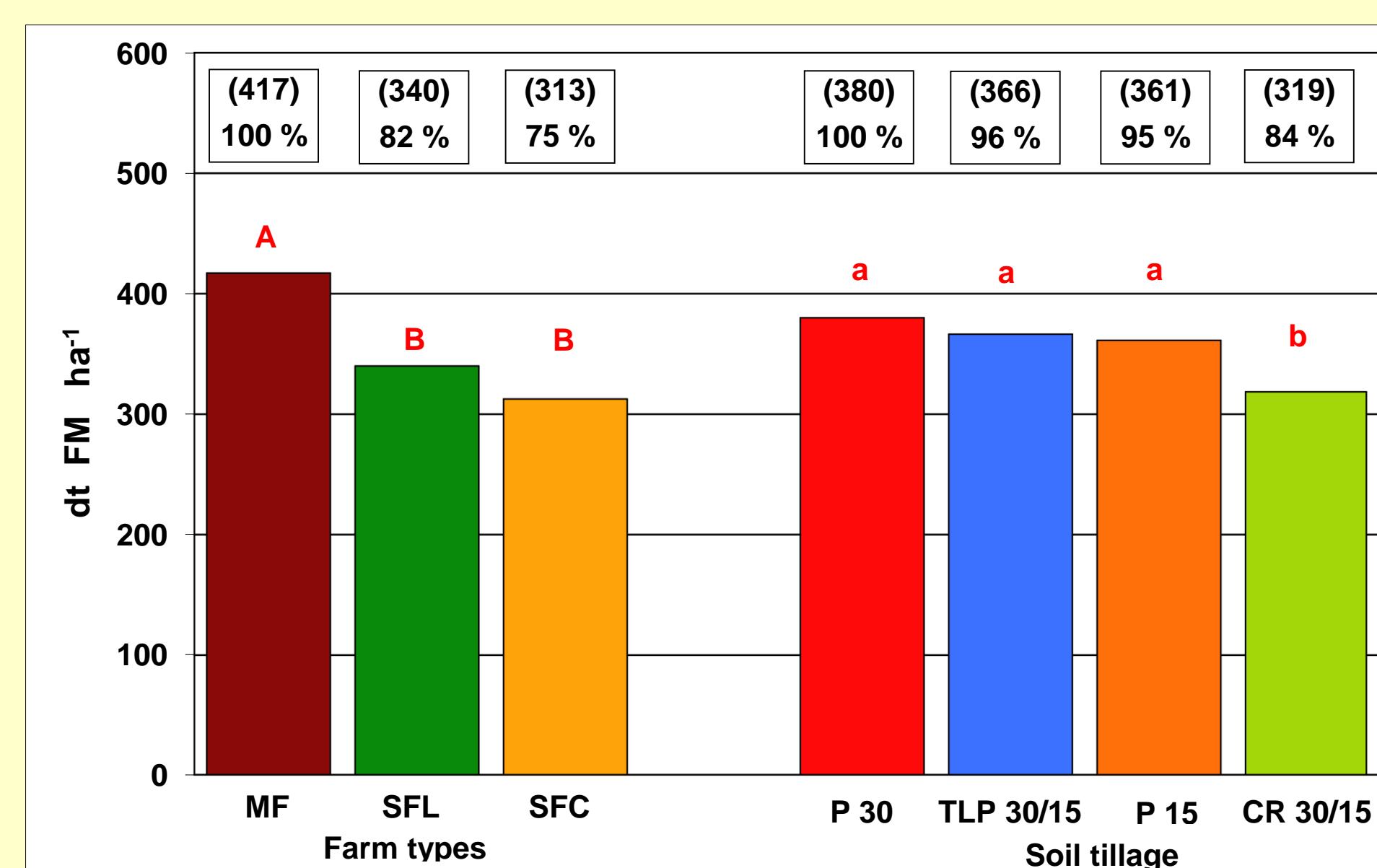


Fig. 2: Yield of potatoes (dt FM ha⁻¹) in the year 2019 dependent on farm type and soil tillage; FM = Fresh Matter

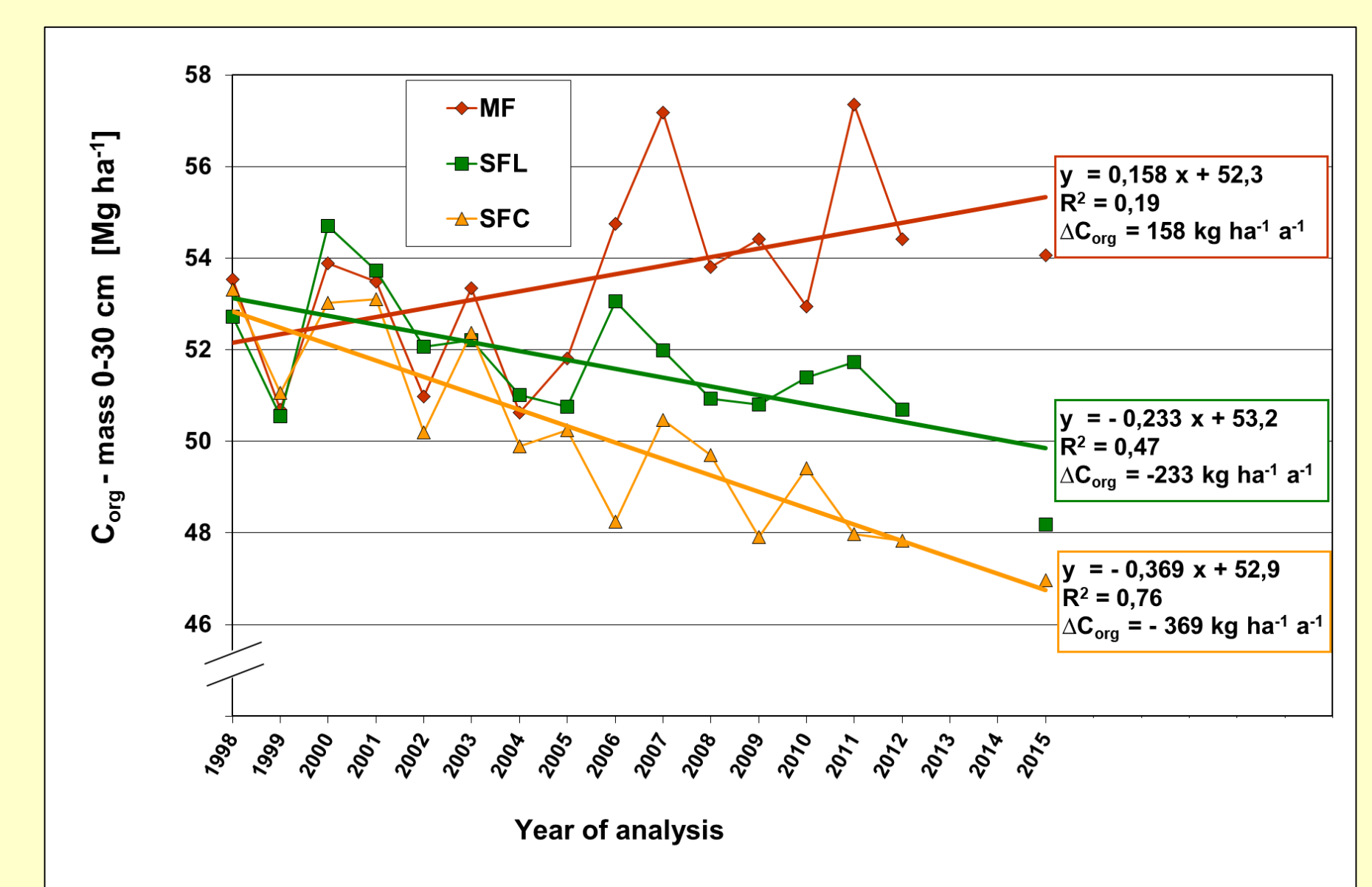


Fig. 3: Development of soil organic carbon (Mg ha⁻¹) from 1998 – 2015 in the topsoil dependent on farm type

5 Conclusions

- With regard to „farm types“:**
 - The superiority of a management system with cattle over stockless organic farming is demonstrated. The mixed farm type led to higher yields and higher amounts of humus in the soil.
 - Long-term reduction of humus in stockless farming is not acceptable.
- With regard to „soil tillage“:**
 - It can be concluded that reduced tillage systems did not yield less than the regularly ploughed reference system if at least a shallow soil inversion was carried out.
 - The reason for lower yields in the soil tillage system without ploughing seems to be the soil structure and the soil temperature and as a consequence of this a lower nutrient availability in special periods of vegetation.

6 References:

Franz Schulz, Christopher Brock, Harald Schmidt, Klaus-Peter Franz & Günter Leithold (2014) Development of soil organic matter stocks under different farm types and tillage systems in the Organic Arable Farming Experiment Gladbacherhof, Archives of Agronomy and Soil Science, 60:3, 313-326, DOI: 10.1080/03650340.2013.794935