Carbon footprint in agroecosystems of temperate climate

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Present-day agriculture hastens the biodiversity loss and remains between the major drivers of climate change and human induced changes to the nitrogen cycle (Rockström et al., 2009). For that reason, considerations regarding the creation of sustainable agricultural production systems as a component of sustainable economy became actual.

Carbon footprint method has suggested for evaluation impact of rotational crops on environment and quantifying the effects in life cycle assessments (IPCC, 2006, Nemecek et al., 2015). Gross primary production (GPP, µmol $m^{-2}s^{-1}$), net ecosystem production (NEP, µmol $m^{-2}s^{-1}$) and respiration emissions from soil and autotrophs (R_{s+a}, µmol m^{-2} s^{-1}) (Fig. 1). Therefore, the aim of this research was to establish the carbon footprints for different rotations and the crops within these rotations for comparison of conventional (CF) and organic farming (OF) systems. This allows for assessment of the agroecosystems associated with different agrotechnologies with respect to their environmental impacts as measured by the carbon footprint. For that purpose, data *in situ* from conventional and organic agroecosystems were analysed to find out more sustainable crops and their rotation.

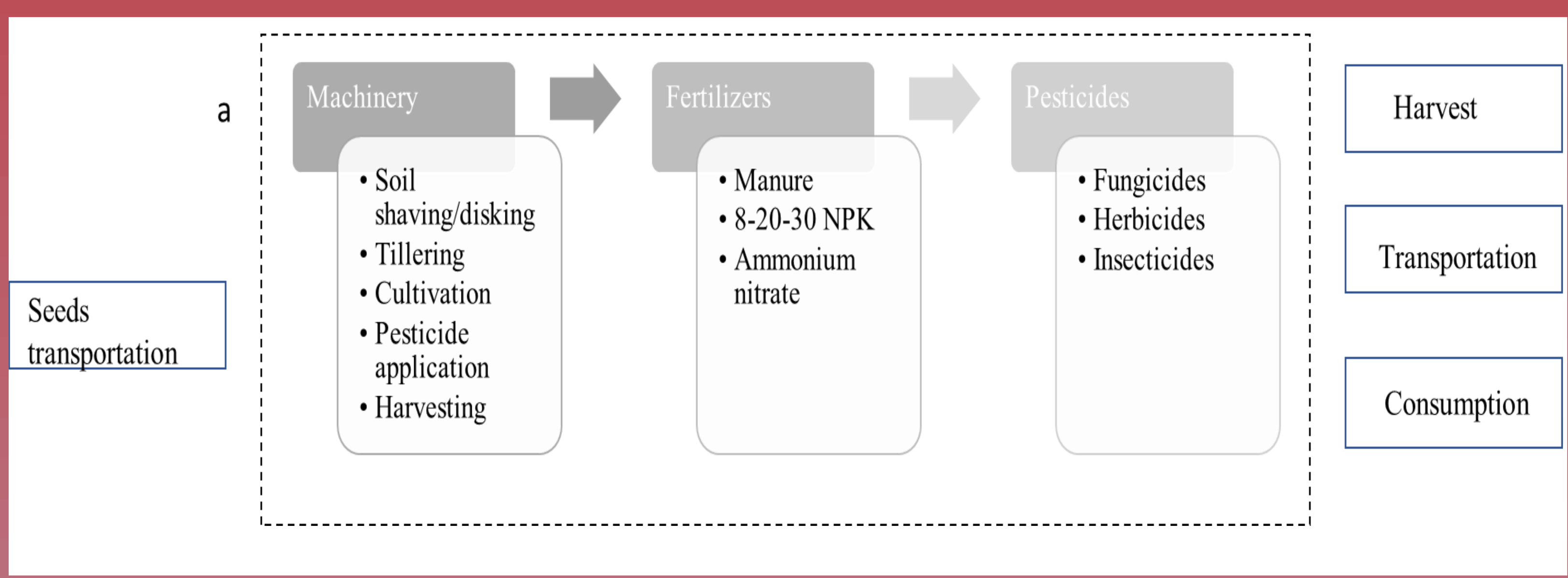


Fig. 1. **Carbon quantifying in agroecosystems of rotational crops**

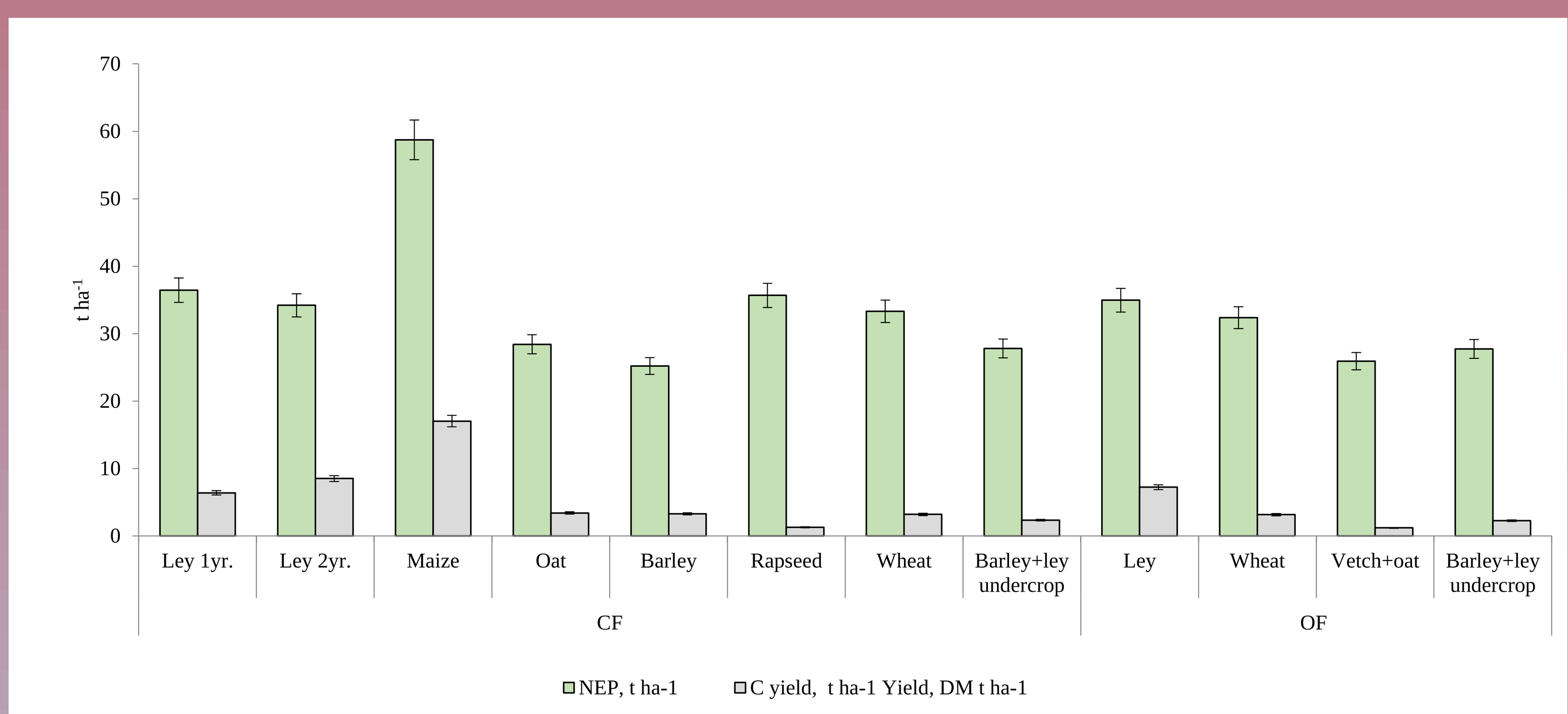
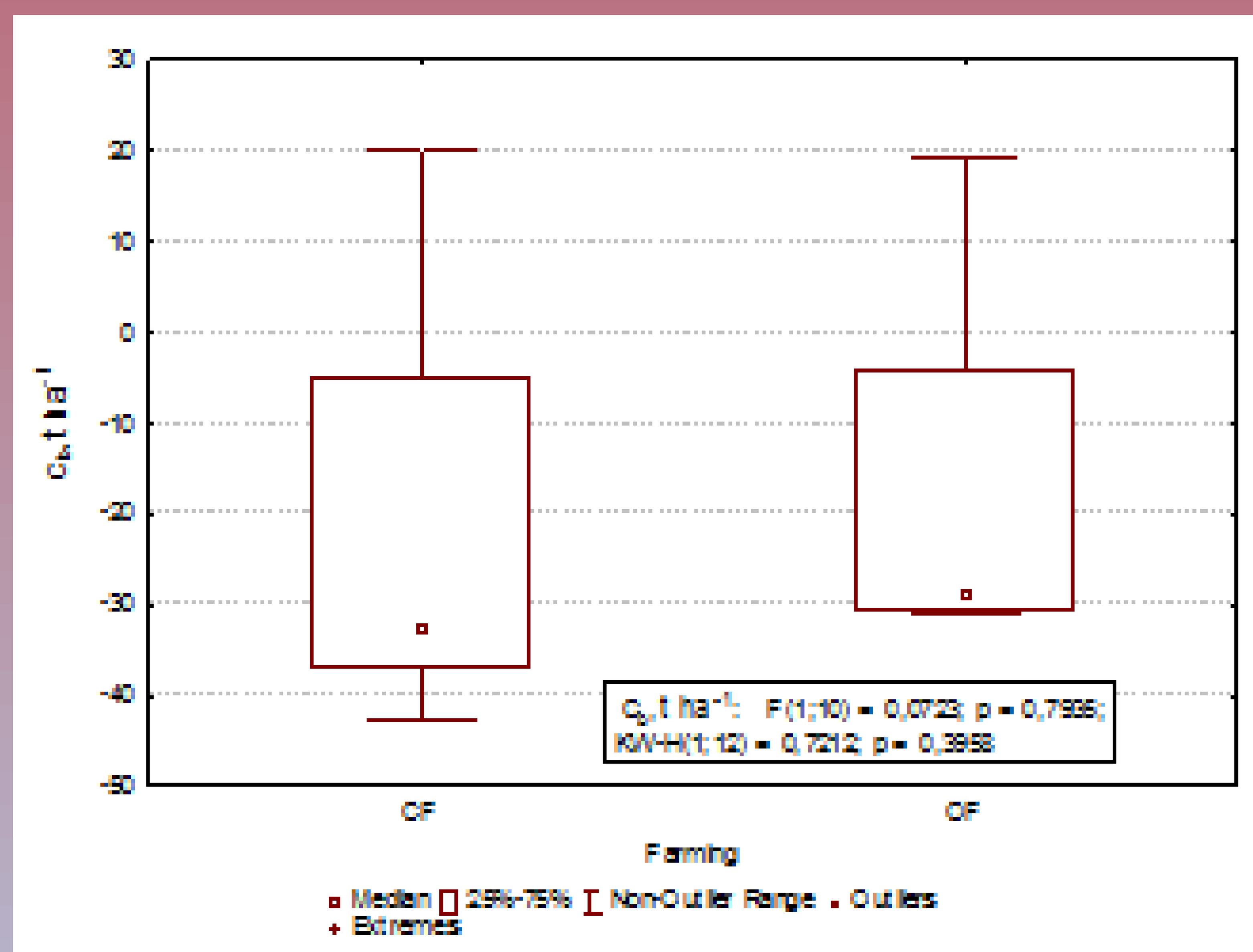


Fig. 2. **Atmospheric carbon sequestration in crop's biomass. CF – conventional farming, OF – organic farming (mean±SD)**
NEP- net ecosystem production



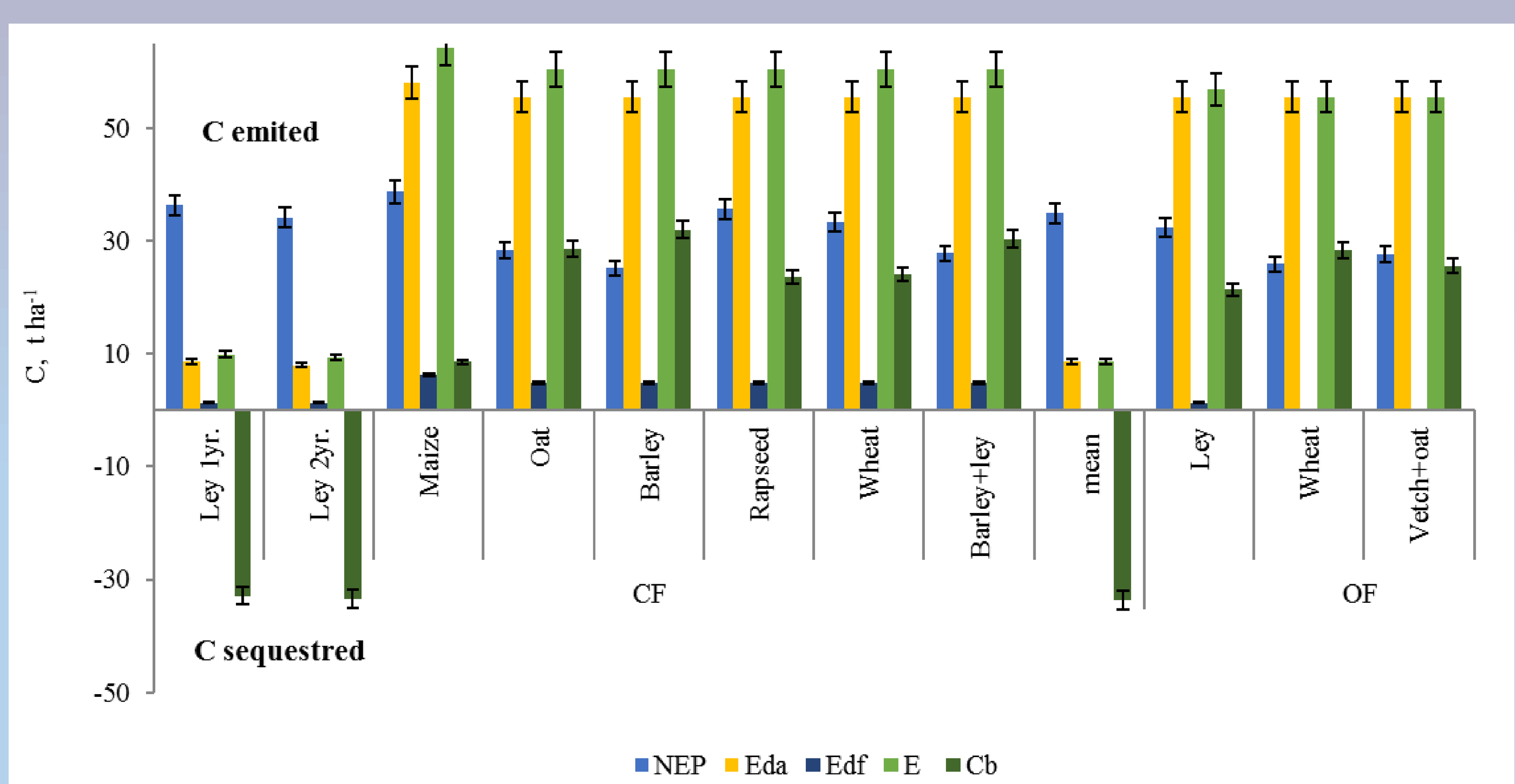


Fig. 3. **Carbon balance in agroecosystems.**
Negative values- sequestered from atmosphere; positive - emitted to atmosphere. Eda -labour input, Edf- agrochemicals applied, Cb - total carbon balance

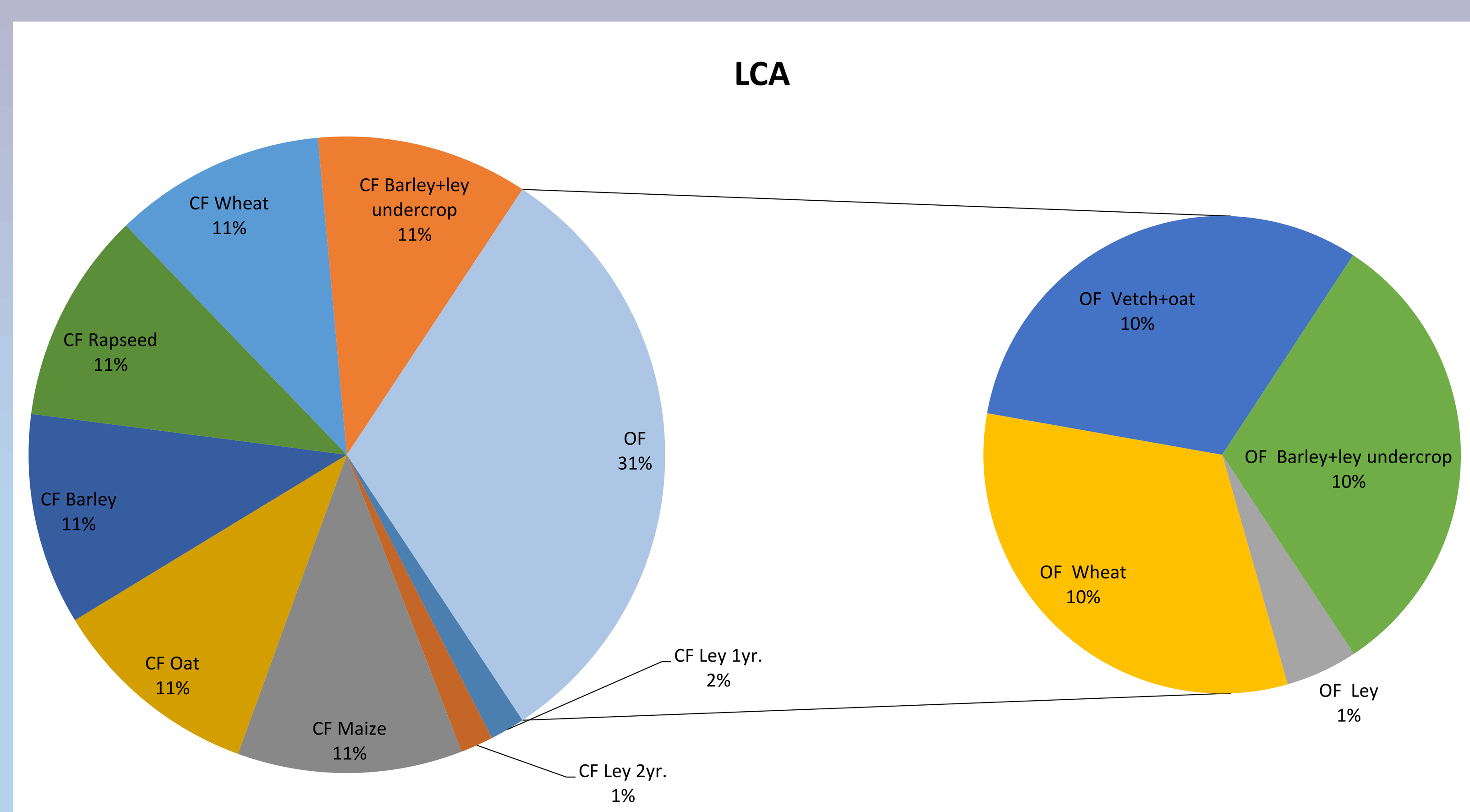


Fig. 4. **Mean values of C exchange indices in agroecosystems of organic (OF) and conventional farming (CF)** (post hoc Tukey's HSD test). LCA – life cycle assesment, Cb – carbon balance

***Conclusion*. The intensive use of agricultural inputs led to increased environmental pressures associated with the conventional farming if compared to the organics one. This once again confirms that conventional farming being less sustainable and contributes to the climate change. The major sources of the increased CO_2 emission in the conventional farming were mineral fertilising and pesticides. Targeting environmental sustainability, the C footprint in various agroecosystems can be used as indicators for the evaluation of agricultural input into the atmospheric C pool, supporting the improvement of sustainable agricultural technologies and the choice crops to reduce CO_2 emissions and mitigate climate change.**

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