EGU21-3967
https://doi.org/10.5194/egusphere-egu21-3967
EGU General Assembly 2021

Carbon balance of annual versus perennial cropping systems

Johannes Wilhelmus Maria Pullens, Ji Chen, and Poul Erik Lærke
Department of Agroecology, Aarhus University, Aarhus, Denmark

To meet the growing challenges of food security, sufficient biomass for biorefineries and mitigation of climate change, perennial grass is recommended as an alternative for annual grain crop to increase biomass production while protecting soil C stock. However, the long-term biomass yield production, soil C stock, and ecosystem CO_2 flux are rarely simultaneously evaluated in the same study site, limiting the understanding of C flows in different cropping systems. We compared the annual grain crop triticale (Triticosecale) grown every year since 2012 with the productive perennial grass festulolium (Festulolium braunii) both established in 2012 and festulolium renewed in 2018. Annual yield production, five-year changes in soil C stock, and ecosystem CO_2 fluxes in 2020 are documented. The first five-year field observations showed that festulolium produced 76% more biomass as compared to triticale (grain and straw). Meanwhile, there was an increasing trend of soil C stock in festulolium but a declining trend of soil C stock in triticale across the first five years, despite both changes were statistically non-significant. By having measurements of the complete carbon balance for 2020, we can investigate the carbon cycling of a cereal and a perennial grass crop. The results improve our knowledge in how we can optimize the biomass, yield and carbon stocks.

Keywords: continuous monoculture; perennial grass; biomass production; soil carbon content; ecosystem CO_2 flux