



Carbon balance of an intensively grazed permanent grassland in southern Belgium

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Grasslands are an important component of the global carbon balance but their carbon storage potential is still highly uncertain. Especially, the impact of weather variability and management practices on grassland carbon budgets need to be assessed. This study investigates the carbon balance of an intensively managed permanent grassland (Dorinne Terrestrial Observatory (DTO)) and its uncertainties by combining 5-years of eddy covariance measurements and other organic carbon exchanges estimates. The specificities of this study lie in: (i) the age of the pasture, which has probably been established since more than one century; (ii) the intensive character of the management with a mean grazing pressure larger than 2 livestock unit ha⁻¹ and stocking cycle including stocking and rest periods, (iii) the livestock production system, typical of Wallonia, farming intensively Belgian Blue breed of cattle in order to produce meat.

The results showed that, despite the high stocking rate and the old age of the pasture and the high stocking rate, the site acted as a relatively stable carbon sink from year to year with a 5-year average Net Biome Productivity of -173 [-128 -203] g C m⁻² yr⁻¹. The carbon sink behavior of the pasture was directly increased by management practices through food complementation and organic fertilization and indirectly by mineral fertilization. The relatively low carbon budget inter-annual variability could be explained both by: (i) grazing management of the farmer that regulated Growth Primary Productivity by adapting the stocking rate to the Leaf Area Index which itself depends on weather conditions, (ii) carbon imports through food complements only when grass regrowth was not sufficient to feed the cattle.

The results suggest that management practices that tend to optimize forage availability for meat production could contribute to maintaining a carbon sink.

Keywords : grassland, carbon budget, carbon dioxide flux, management, eddy covariance