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*Supplement of*

## **Determination of the carbon budget of a pasture: effect of system boundaries and flux uncertainties**

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## Supplementary material

**Table S1:** Components of the average carbon (C) and nitrogen (N) budget of the dairy cows (Eq. 5 and 9) with uncertainties (95% confidence range). The budget was closed by adjusting the amount of excreta loss.

	Animal C exchange rate		Animal N exchange rate	
	(kg C head <sup>-1</sup> d <sup>-1</sup> )	(% of intake)	(g N head <sup>-1</sup> d <sup>-1</sup> )	(% of intake)
$E_{C/N\text{-intake}}$	$8.0 \pm 2.2$	100	$508 \pm 137$	100
$E_{C\text{-resp}}$	$4.6 \pm 1.6$	57	-	-
$E_{C\text{-CH}_4\text{,cow}}$	$0.3 \pm 0.02$	4	-	-
$E_{C/N\text{-milk}}$	$1.5 \pm 0.2$	19	$124 \pm 13$	24
$E_{C/N\text{-meat}}$	<0.1	<1	<5	<1
$E_{C/N\text{-excreta}}$	$1.6 \pm 0.7$	20	$380 \pm 138$	75

**Table S2:** Components and uncertainties (95% confidence range) of annual carbon fluxes ( $\text{g C m}^{-2} \text{ yr}^{-1}$ ) determined for the total system and pasture system approach. NECB was calculated according to Eqs. (2) and (3). Flux direction is defined according to ecological sign convention: positive values indicate imports to the system, negative values indicate export (loss) from the system of interest.

	Total system (incl. cows)	Pasture only (excl. cows)
$F_{\text{C-CO}_2,\text{tot}}$	$+68 \pm 54$	
$F_{\text{C-CO}_2,\text{past}}$		$+248 \pm 44$
$F_{\text{C-CH}_4,\text{soil}}$	$-2 \pm 1$	$-2 \pm 1$
$F_{\text{C-CH}_4,\text{cows}}^{1)}$	$-17 \pm 1$	
$F_{\text{C-fertil}}^{2)}$	$+77 \pm 13$	$+77 \pm 13$
$F_{\text{C-grazing}}$		$-404 \pm 61$
$F_{\text{C-excreta,past}}$		$+64 \pm 29$
$F_{\text{C-products}}$	$-82 \pm 8$	
$F_{\text{C-feed,off}}$	$+31 \pm 2$	
$F_{\text{C-resp,off}}$	$-65 \pm 23$	
$F_{\text{C-excreta,off}}$	$-23 \pm 10$	
NECB	$-13 \pm 61$	$-17 \pm 81$

<sup>1)</sup> including  $F_{\text{C-CH}_4,\text{cows}}$  during off-pasture times

<sup>2)</sup>  $75 \text{ g C m}^{-2} \text{ yr}^{-1}$  as cattle slurry and  $2 \text{ g C m}^{-2} \text{ yr}^{-1}$  as urea