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Gross changes in forest area shape the future carbon balance of tropical forests

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Figure S1 Temporal change of cumulative carbon flux in different assumed scenarios using different response curve combinations. Dotted line indicates the zero line. Response curve combinations from C3 to C8 demonstrate similar conclusions as C1 and C2 but with slight differences in the magnitude.

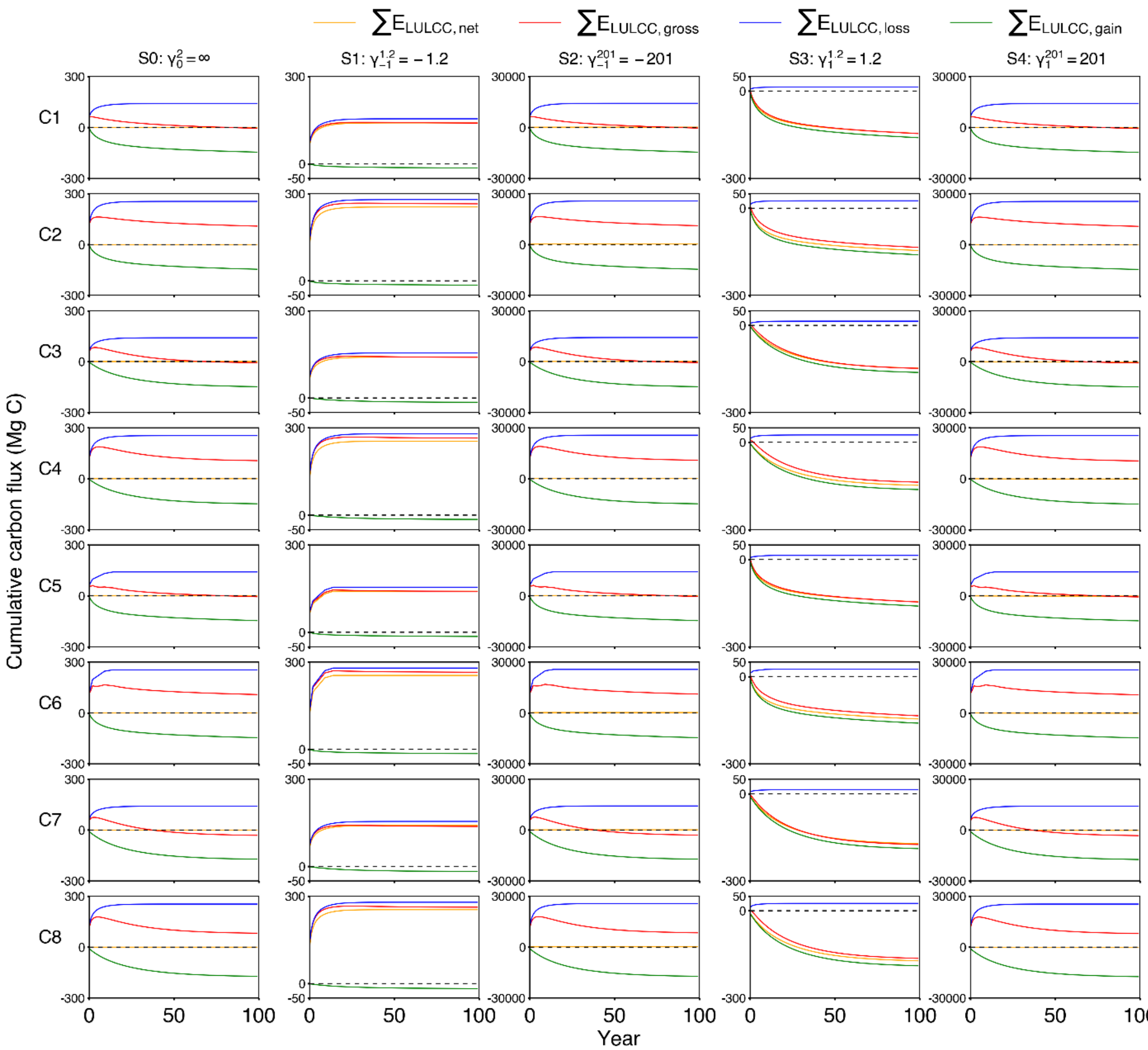

Figure S2 Temporal change of annual carbon flux in different assumed scenarios using the response curve combination C1 (secondary forest loss and logarithmic biomass recovery curve, solid lines) and C2 (primary forest loss and logarithmic biomass recovery curve, dashed lines). The dotted line is the zero line.

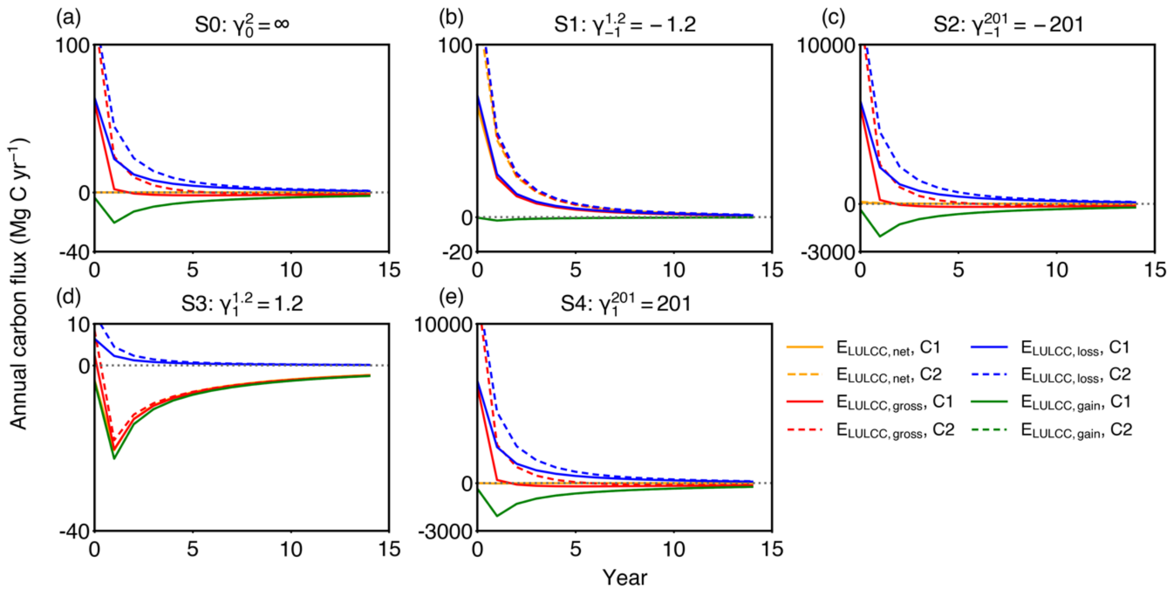

Figure S3 The critical value of $\gamma_{\mathrm{Anet}}^{\mathrm{Agross}}$ at which $\Sigma E_{LULCC,gross}$ is zero, going from a net source to a net sink with different time horizons, using the biomass recovery response curves from Poorter et al. (*2016*) (solid, same as **Figure 4c**) and from Hansis et al. (*2015*) (dashed). Values larger than this critical value indicate that the initial forest area change has the net cumulative effect to emit CO_2 at a given time-horizon on the x-axis. Note the different y-axis scale. The lower critical ratio values in the case of primary forest initial loss is because primary forests have a larger biomass, so that a small gross-to-net initial change in forest area will legate a source at a given horizon than if secondary forests are initially lost.

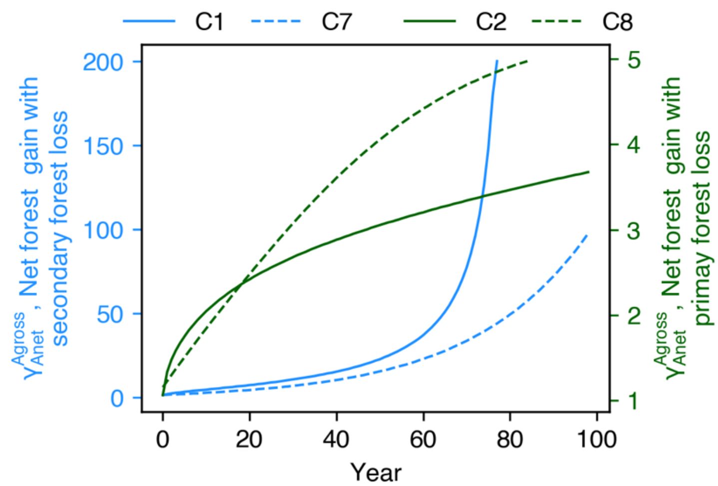

Table S1 Number of 0.5° × 0.5° grid cells with $\gamma_{\mathrm{Anet}}^{\mathrm{Agross}}$ above the critical ratio for which the system is a net cumulative source of CO_2 to the atmosphere, for different time horizons. The calculation was done using the biomass recovery response curves from Hansis et al. (*2015*) and Poorter et al. (*2016*) in Latin America. The values of $\gamma_{\mathrm{Anet}}^{\mathrm{Agross}}$ were calculated based on high-resolution net and gross forest area change data from Hansen et al. (*2013*) during 2000-2012. Secondary-to-secondary represents a net forest gain with gross secondary forest loss by assuming that all lost forests were secondary, and primary-to-secondary represents a net forest gain with gross primary forest loss by assuming that all lost forests were primary.

		20 yr		50 yr		100 yr	
		Critical ratio	Grid cell number	Critical ratio	Grid cell number	Critical ratio	Grid cell number
secondary-to-	Poorter et al.	7.2	102	22.5	42	-	-
secondary	Hansis et al.	4.2	143	15.3	57	97.4	9
primary-to-	Poorter et al.	2.4	199	3.1	175	3.7	155
secondary	Hansis et al.	2.5	198	4.1	147	5.0	126

Table S2 Cumulative carbon flux (Tg C) using gross transitions ($\Sigma E_{\mathrm{LULCC,gross}}$) and net transitions ($\Sigma E_{\mathrm{LULCC,net}}$) in the grid cells with $\gamma_{\mathrm{Anet}}^{\mathrm{Agross}}$ beyond the critical ratios at different time horizons. The gross and net forest area changes are based on the data from Hansen et al. (*2013*). Positive value of carbon flux indicates carbon emission to the atmosphere. Secondary-to-secondary represents a net forest gain with gross secondary forest loss (C1) by assuming that all lost forests were secondary, and secondary-to-primary represents a net forest gain with gross primary forest loss (C2) by assuming that all lost forests were primary.

Tg C	C1: secondary-to-secondary			C2: primary-to- secondary		
Time horizon	Critical ratio	$\Sigma E_{\mathrm{LULCC,gross}}$	$\Sigma E_{\mathrm{LULCC,net}}$	Critical ratio	$\Sigma E_{\mathrm{LULCC,gross}}$	$\Sigma E_{\mathrm{LULCC,net}}$
20 yr	7.2	21	-12	2.4	162	-38
50 yr	22.5	3	-2	3.1	125	-39
100 yr	-	-	-	3.7	99	-36