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Supplementary materials

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**Table S1.** Comparison of the performance of the fitting results between Model 1 and Model 2 using the Akaike information criterion and the Bayesian information criterion.

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	<u>AIC</u>		<u>BIC</u>	
	Model 1	Model 2	Model 1	Model 2
BG	83.25	77.73	106.33	93.12
NAG	81.50	76.73	104.58	92.12
LAP	12.73	11.57	10.35	3.82
AP	80.45	74.47	103.53	89.86

BG,  $\beta$ -glucosidase; NAG, *N*-acetylglucosaminidase; LAP, leucine aminopeptidase; AP, acid phosphatase; AIC, Akaike information criterion; BIC, Bayesian information criterion

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**Table S2.** Model parameters of Equation 5 for residual soil C contents under different tree species across time with different extracellular enzyme activities.

	BG	NAG	LAP	AP
$\beta_0$	-2.19785309	-2.39483244	-0.55407280	-0.50758993
$\beta_1$	0.08273358	0.07592116	0.03148246	0.07480559
$\beta_{2sp}$	-0.48260712	0.25997095	-0.24294259	-0.33588831
$\beta_{2hp}$	-0.09399809	0.43360852	-0.00285819	0.12975114
$\beta_{2kp}$	0.08828864	0.33102009	0.12017906	0.11112443
$\beta_3$	0.02919402	0.04245054	0.01179556	0.04770020

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BG,  $\beta$ -glucosidase; NAG, *N*-acetylglucosaminidase; LAP, leucine aminopeptidase; AP, acid phosphatase

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**Table S3.** Model parameters of Equation 6 for residual soil N contents under different tree species across time with different extra-cellular enzyme activities.

	NAG	LAP
$\beta_0$	-2.39203701	-0.56717981
$\beta_1$	0.07592116	0.03148246
$\beta_{2sp}$	0.28903302	-0.22794473
$\beta_{2hp}$	0.30922792	-0.03046445
$\beta_{2kp}$	0.17212690	0.08319450
$\beta_3$	1.27357366	0.36988125

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NAG, *N*-acetylglucosaminidase; LAP, leucine aminopeptidase

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**Table S4.** Half-residence time of residual soil C contents under different tree species with different extra-cellular enzyme activities. The total soil C decomposition over time was calculated via Equation 5. We set the half-residence time under *Eucalyptus* for different enzyme activities as  $t$  and compared it with other half-residence times under coniferous tree species.

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	BG	NAG	LAP	AP
Slash pine	0.94t	0.52t	0.61t	1.01t
Hoop pine	0.64t	0.44t	0.48t	0.63t
Kauri pine	0.53t	0.49t	0.42t	0.64t
<i>Eucalyptus</i>	t	t	t	t

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BG,  $\beta$ -glucosidase; NAG, *N*-acetylglucosaminidase; LAP, leucine aminopeptidase; AP, acid phosphatase

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10 **Table S5.** Half-residence time of residual soil N contents under different tree species with different extracellular enzyme activities. The total soil N decomposition over time was calculated via Equation 6. We set the half-residence time under *Eucalyptus* for different enzyme activities as  $t$  and compared it with other half-residence times under coniferous tree species.

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	NAG	LAP
Slash pine	0.56t	0.72t
Hoop pine	0.55t	0.59t
Kauri pine	0.63t	0.52t
<i>Eucalyptus</i>	t	t

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NAG, *N*-acetylglucosaminidase; LAP, leucine aminopeptidase

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