SUPPLEMENTARY FILE

S1 Description of the tested fertilization functions

Both tested functions, Rosvall (1980) and Pettersson (1994), predict the stand-level response to N fertilizer over the first five years after fertilization (m^3 over bark ha^{-1} 5 $years^{-1}$) with linear models. The models are presented in Table S1.

The function developed by Rosvall (1980) was based on fertilization experiments undertaken by Institut för skogsförbättring (Institute for forest improvement), today part of the Forestry Research Institute of Sweden, in the period 1967-1977. The experiments consisted of totally 933 plots in 234 locations covering the whole Sweden, most experiments being established by commercial forestry. Summary statistics of the variables are not presented, but it is stated that the relevant stand and site indices are well covered. The selection of plots was not completely random. However, the selection method is not presented other than it is stated that considerably heterogeneous and poorly managed stands were underrepresented in the material. The function's precision is stated as "low", with standard deviation being 3.79 m^3 ha^{-1} 5 $years^{-1}$. The information regarding the data and model development in Rosvall (1980) is limited.

Pettersson (1994) developed new predictive functions for five-year response to fertilization based on experiments owned by the Forestry Research Institute of Sweden and the Swedish University of Agriculture on mineral soil for which data were available after first-time fertilization. Almost half of the experimental plots were established by forestry companies. Experimental plots that deviated largely from controls were excluded, with exclusion criteria set to 25% of basal area at time of treatment, 25% of basal area growth the 5 years prior to fertilization, 10% of basal area growth the last year prior to treatment and 30% regarding the number of stems per hectare. Plots with more than 20% hardwood, that had been fertilized

during winter time or dosages exceeding 250 kg N ha^{-1} were likewise excluded. The two increment exclusion criteria were only applied for parts of the plots where borings had been undertaken. After applying these criteria, the data material used for model development consist of 1066 plots from 249 experiments. The standard deviation is 3.54 m^3 ha^{-1} 5 $years^{-1}$, thus similar to the Rosvall model. 48% of the variation in the data is explained by the model.

While Pettersson (1994) used the quotient method to account for differences in growth prior to treatment between control and fertilized plot, Rosvall (1980) did not explain whether this or another method was used. Both authors suggest to add a reduction factor to the functions when they are applied to practical forestry due to unexplained variance and unevenness in stands, 10% and 15% for Pettersson (1994) and Rosvall (1980), respectively. This was not done for the testing of the functions on the Norwegian data, as these data also consisted of experimental plots.

Rosvall (1980) function (for definition of variables, please see Table S1):

Log (Response) = - 4.298110 + 1.500548 Log(AN[1]) + 1.414132 Log(Urea[1]) - 0.012080 SI - 0.000105 AN_SI[1] - 0.000091 Urea_SI[1] - 0.018376 Lat + 0.359554 Log (Lat) - 0.000694 Alt + 0.588503 Log (Alt) + 0.424878 Log(CAI) - 0.003438 Age +0.412783 Log(Age) + 0.007016 Pine

Pettersson (1994) function (for definition of variables, please see Table S1):

Log (Response) = -5.067246 + 1.335267 Log(AN[1]) + 1.226132 Log(Urea[1]) + 0.010600 SI - 0.000090 AN_SI[1] -0.00057 Urea_SI[1] + 1.719173 Log(Alt) +0.119126 Lat61N[2] + 0.058646 Lat58_61[2] - 0.000030 Lat_Alt - 0.215528 Log(Lat_Alt) - 0.051843 CAI_Pine[3] + 0.781026 Log(CAI_Pine[3]) + 0.0306321 Log(CAI_Spruce[4])

[1)] The respective coefficient for either AN or urea is used.
[2)] The respective coefficient for latitudes is used.
[3)] The coefficient is used in pine-dominated stands.
[4)] The coefficient is used in spruce-dominated stands.

Table S1: Rosvall (1980) and Pettersson (1994) predictive functions for growth response to N fertilization. Dependent variable: log (fertilizer response) (m^3 ha^{-1} 5 yrs^{-1} above bark). AN is ammonium nitrate.

Variable	Definition	Rosvall (1980) Coefficients	Pettersson (1994) Coefficients	Unit
Log (Response)	Log (fertilizer response)			
	Constant	- 4.298110	-5.067246	
Log(AN)	Log (nitrogen dose AN[1])	1.500548	1.335267	log (kg AN-N ha^{-1})
Log(Urea)	Log (nitrogen dose urea[1])	1.414132	1.226132	log (kg urea - N ha^{-1})
SI	Site index (H100)	- 0.012080	0.010600	m
AN_SI	Nitrogen dose x site index AN[1)]	- 0.000105	- 0.000090	(kg AN-N ha^{-1} x m)
Urea_SI	Nitrogen dose x site index urea[1)]	- 0.000091	- 0.00057	(kg urea- N ha^{-1} x m)
Lat	Latitude	- 0.018376		(° N -54)
Log(Lat)	Log (latitude)	0.359554		log (° N -54)
Alt	Altitude	- 0.000694		(m + 100)
Log(Alt)	Log (altitude)	0.588503	1.719173	log (m + 100)
Log(CAI)	Log (current annual increment)	0.424878		log (m^3 o.b. ha^{-1} $year^{-1}$)
Age	Age at breast height	- 0.003438		years at fertilization
Log(Age)	Log (Age at breast height)	0.412783		log (years at fertilization)
Pine	Proportion of pine	0.007016		tenth +1
Lat_61N	Latitude 61 N and above[2)]		0.119126	(° N)
Lat58_61	Latitude 58-61[2)]		0.058646	(° N)
Lat_Alt	Latitude x altitude		- 0.000030	° N x m
Log(Lat_Alt)	Log (latitude x altitude)		- 0.215528	log (° N x m)
CAI_Pine	Current annual increment Scots pine[3]		- 0.051843	m^3o.b. ha^{-1} $year^{-1}$
Log(CAI_Pine)	Log (current annual increment Scots pine[3])		0.781026	Log (m^3o.b. ha^{-1} $year^{-1}$)
Log(CAI_Spruce)	Log (current annual increment Norway spruce[4])		0.0306321	Log (m^3o.b. ha^{-1} $year^{-1}$)

[1)] The respective coefficient for either AN or urea is used.
[2)] The respective coefficient for latitudes is used.
[3)] The coefficient is used in pine-dominated stands.
[4)] The coefficient is used in spruce-dominated stands.