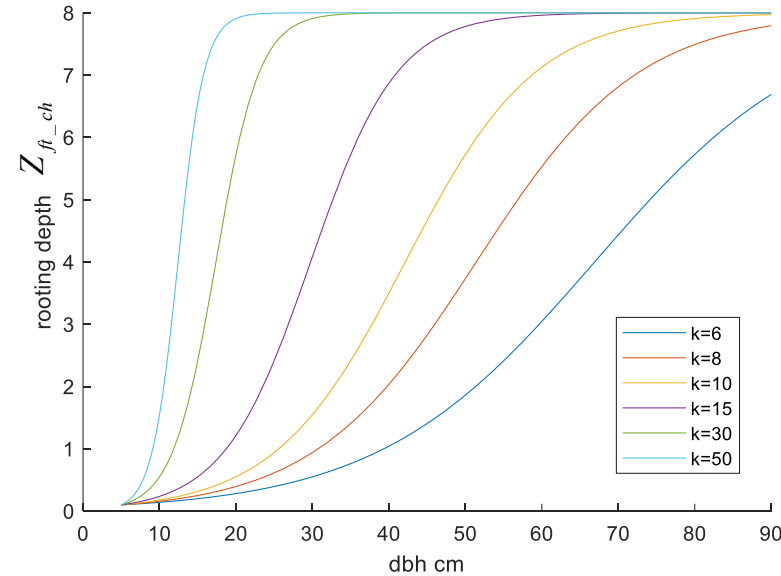# Cohort based rooting dep. – logistic model

$$Z_{ft\_ch} = \frac{Z_{ft\_max}}{1 + \left(\dfrac{Z_{ft\_max} - Z_{ft\_0}}{Z_{ft\_0}}\right) \cdot \exp(-k \cdot dbh^*)}$$

$$dbh^* = \frac{dbh - dbh_0}{dbh_{ft\_max} - dbh_0}$$

Zftmax=8; dbhftmax=90; dbh0=5; Zft0=0.1;

Z_{ft_ch} : rooting depth of the cohort

Z_{ft_max} : maximum potential rooting depth of a PFT, corresponding to dbh or constrained by physical condition e.g soil depth or water table depth

Z_{ft_0} : rooting depth of recruitment, same for all the PFT,

dbh_{ft_max} : maximum dbh a PFT can have

dbh_0 : dbh of the recruitment/sappling

k : parameter determine how fast rooting depth increases with relative size, aka grow rate
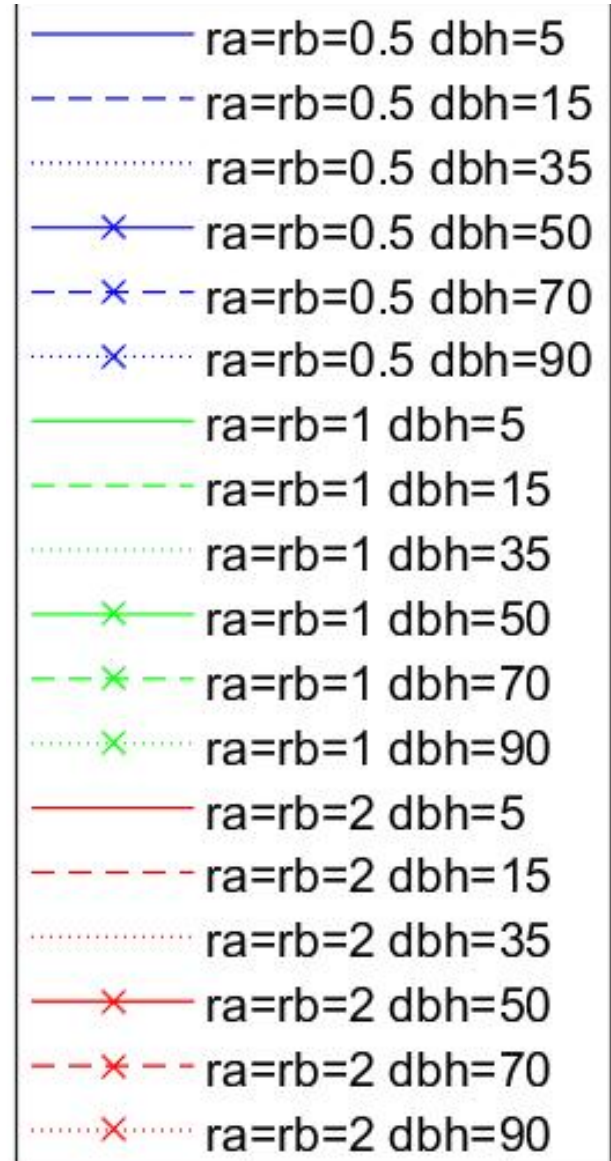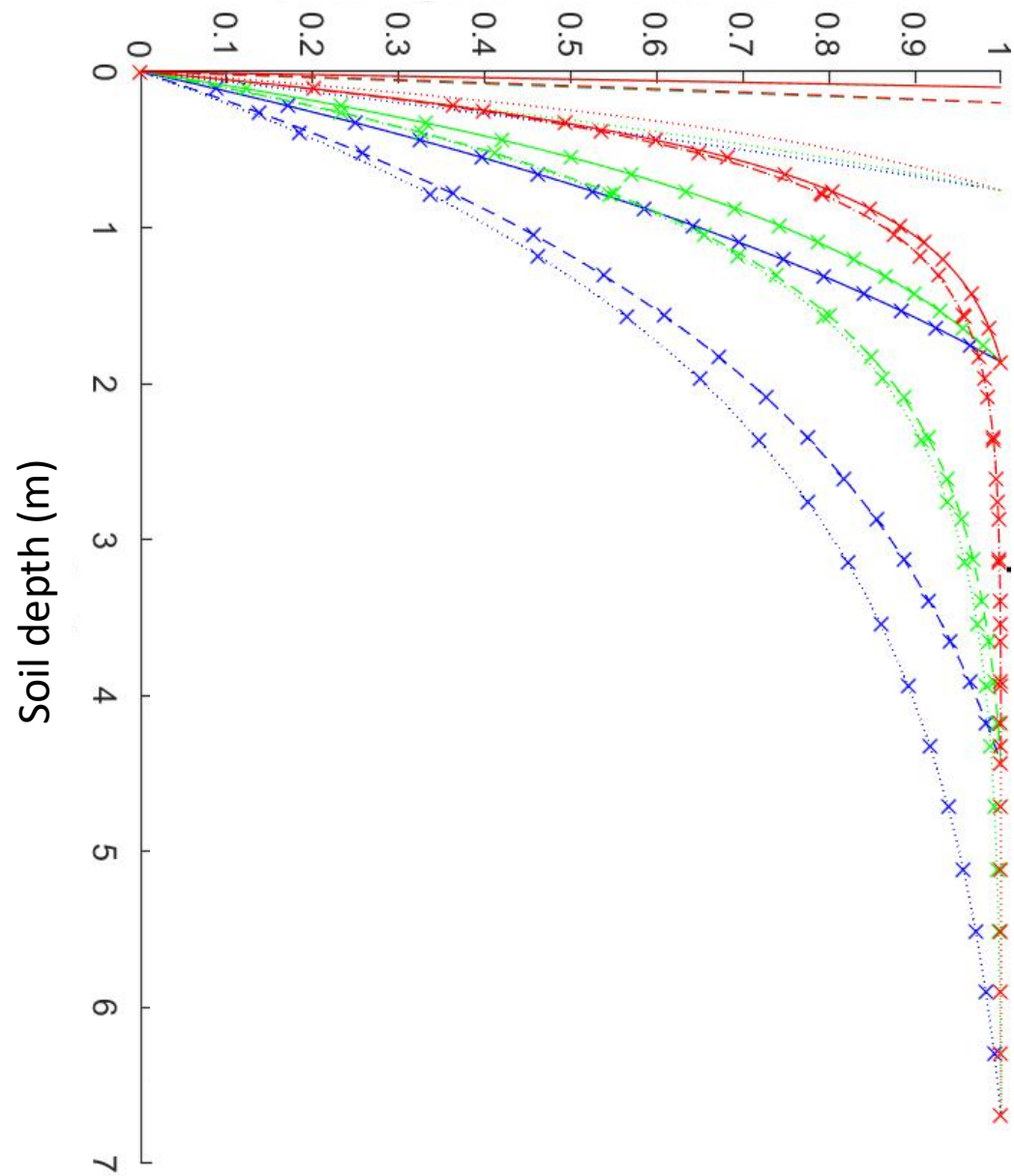
References:
Brum et, al. (2019)
Sakschewski et, al., 2020

Modelled root distribution profile of cohorts (k=6)

Cumulative percentage of fine root biomass

Soil depth (m)

———	ra=rb=0.5 dbh=5
– – –	ra=rb=0.5 dbh=15
·········	ra=rb=0.5 dbh=35
—✕—	ra=rb=0.5 dbh=50
–✕–	ra=rb=0.5 dbh=70
··✕··	ra=rb=0.5 dbh=90
———	ra=rb=1 dbh=5
– – –	ra=rb=1 dbh=15
·········	ra=rb=1 dbh=35
—✕—	ra=rb=1 dbh=50
–✕–	ra=rb=1 dbh=70
··✕··	ra=rb=1 dbh=90
———	ra=rb=2 dbh=5
– – –	ra=rb=2 dbh=15
·········	ra=rb=2 dbh=35
—✕—	ra=rb=2 dbh=50
–✕–	ra=rb=2 dbh=70
··✕··	ra=rb=2 dbh=90

Modelled root distribution profile of cohorts using different k

Cumulative percentage of fine root biomass