Turtiainen M., Miina J., Salo K., Hotanen J-P. (2016). Modelling the coverage and annual variation in bilberry yield in Finland. Silva Fennica. http://dx.doi.org/10.14214/sf.1573.

Supplementary file 3

The general multi-level binomial model (Model 1) used in this study was as follows:

$$y_{ijklm} \sim \mathrm{Bin}(n_{ijklm}, p_{ijklm})$$

$$\mathrm{logit}(p_{ijklm}) = \mathrm{X}_{ijklm}^{\mathrm{T}}\beta + u_i + u_{ij} + u_{ijk} + u_{ijkl} + u_{ijklm} \tag{1}$$

where y is the mean percentage coverage of 2-m^2 quadrates in the stand; Bin(n, p) denotes the binomial distribution with parameters n (binomial sample size; in this study, all n_{ijklm} are equal to 100) and p (expected coverage of the species); logit(p) is a logit-link function; and X_{ijklm} are the fixed predictor variables with corresponding coefficients vector β. Subscripts i, j, k, l and m refer to the forestry centre region, municipality, cluster, sample plot and stand, respectively. u_i, u_{ij}, u_{ijk}, u_{ijkl} and u_{ijklm} are normally distributed random effects with a mean of 0 and constant variances.

The general multi-level Poisson model (Model 2) used in this study was as follows:

$$y_{ijmt} \sim \mathrm{Poisson}(\pi_{ijmt})$$

$$\ln(\pi_{ijmt}) = \mathrm{X}_{ijmt}^{\mathrm{T}}\beta + u_i + u_{ij} + u_{ijm} + u_{ijmt} \tag{2}$$

where y is the mean number of berries on five 1-m^2 quadrates in the stand in year t; the conditional distribution of y, given the expected value π, is the Poisson distribution; $\ln(\pi)$ is a log-link function; and X_{ijmt} are the fixed predictor variables with corresponding coefficients vector β. Subscripts i, j, m and t refer to the forestry centre region, municipality, stand and year, respectively. u_i, u_{ij}, u_{ijm} and u_{ijmt} are normally distributed random effects with a mean of 0 and constant variances. In Eq. 1 and 2, random terms at different hierarchical levels were assumed to be uncorrelated.