

DOES SAMPLE PLOT SIZE AFFECT VARIANCE OF BIOMETRIC PARAMETERS AND GINI INDEX ESTIMATES?

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PROJECT GOAL The main goal of this article is to optimize the size of sample plot area for use in statistical forest inventory (SFI). When the size of a sample plot changes, the variance of individual parameter estimates change. We utilized the Gini index of the diameter structure as an indicator of variance.

INTRODUCTION

To mitigate the global climate change impact, it is suitable to support structural diversity of forests. In the future, adaptive approaches have to be developed in order to survey the biometric parameters for increment quantification. An inventory based on permanent control sample plots (CSP) was developed for this purpose. Three circular plots ($r_1 = 3\text{m}$, $r_2 = 7\text{m}$, $r_3 = 12,62\text{m}$) for inventorying of three respective DBH classes ($7\text{cm} \leq \text{DBH} < 12\text{cm}$; $12\text{cm} \leq \text{DBH} < 30\text{cm}$; $\text{DBH} \geq 30\text{cm}$) were developed (Fig. 1). This research was done in forest district Habrůvka (TFI Křtiny, Czech Republic). Inventory grid of this district consists of 270 control sample plots. We used the Gini index for diameter structure description. The resulting Gini index values can be divided into 4 categories: Even-sized, two-sized, uneven-sized irregular, uneven-sized balanced (Duduman, 2011).

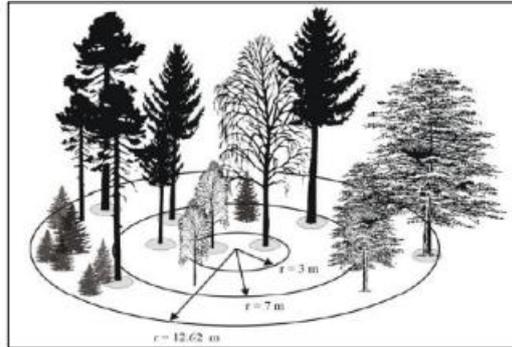


Fig. 1: Design of SFI area with radius of every circle. Černý (2004)

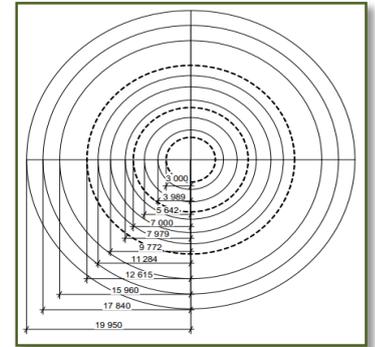


Fig. 2: Design of research plot

MATERIAL AND METHODS

A subset of 40 ontrol sample plots on nutrient habitats ranging from 400 to 550 m a. s. l. was selected for the research. Plots were sorted according to the value of the Gini index into 4 categories and selected randomly. On every single plot we used the design of research plot depicted on Fig. 2. We measured DBH of every tree ($\text{DBH} > 6\text{cm}$) on a circle with $1\,250\text{m}^2$ area. Heights of sample trees were measured on every plot. The height of non-sampled trees were computed using the Chapman-Richards equation. Subsequently, trees were filtered according to the distance to the plot center.

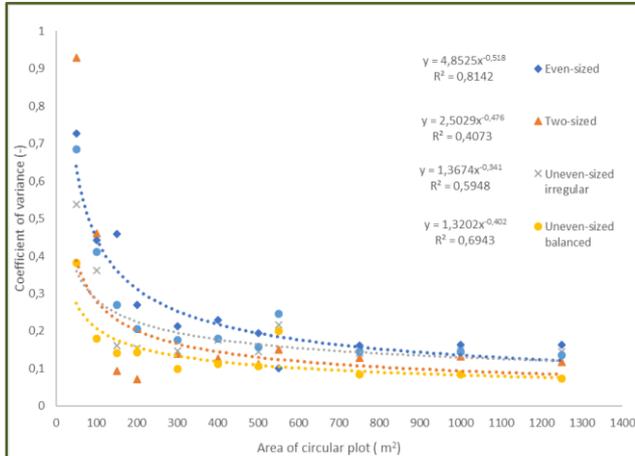


Fig. 3. Preliminary results of the effect of the size of the "CSP" area on the coefficient of variance of the Gini index

CONCLUSION

This research revealed the influence of sample plot size to variance of diameter structure estimates. In close-to-nature and uneven-sized management we will need reliable estimates of structural indices. Despite the use of CSP, a smaller number of sample plots showed and confirmed a possible reduction of sample plot size.

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RESULTS AND DISCUSSION

Our results indicate a relationship between the sample plot size and the variance of the Gini index. Fig. 3 shows that variance of CSP circles ($X\text{-axis} = 550$) were bigger than the variance in 150, 200 and 300 m^2 circles. We conclude, that we can reduce the sample plot sizes and still satisfactorily describe the diameter structure when all trees are measured. Similar results shows Schütz (2011) for example of Wiedmann (1961). Our results may be affected by limited number of sample plots. Further calculations will show how the decreased sample plot area would affect the accuracy of the CSP method itself, or whether a smaller area will be sufficient. Fig. 4 shows, how the median of Gini indices is changing. Uneven-sized balanced is constantly balanced by structure. Other types of forest structure shows logarithmically increasing values.

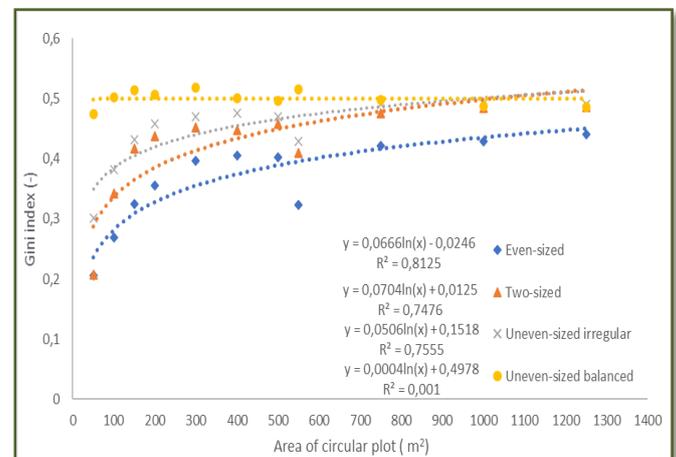


Fig. 4. Preliminary results of the effect of the size of the "CSP" area ($X\text{-axis} = 550$) on the median of the Gini index