

Original article

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Estimation of Statistical Models of Distribution of Diameters of Trees in Pine Plantations

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Abstract. In forestry, a wide range of probability density functions are currently used to model the distribution of tree diameters. The aim of the study is to compare several statistical distribution models in terms of flexibility and ability to best describe the distribution of tree diameters using the example of pine forest plantations. We used data on 231 series of tree diameters distribution on 24 permanent test plots in pine forest plantations of the Forest Experimental Station of the Russian State Agrarian University – Moscow Timiryazev Agricultural Academy. The 12 distribution functions were analyzed as models of tree diameter distribution: beta distribution, gamma distribution, Chi distribution, Chi-square distribution, SB-Johnson distribution, SU-Johnson distribution, lognormal distribution, Nakagami, Pearson type III, normal distribution and distribution of Weibull. To assess the correspondence of theoretical distributions to the actual data, the square root of the mean square error, the mean absolute error, the mean bias of the errors was calculated, and the Kolmogorov-Smirnov test and the Chi-square test were performed. Analyzing the results of aligning the distribution series of the diameters of pine trees in crops, we can conclude that, according to most of the considered criteria, the Weibull three-parameter distribution is most consistent with the actual data. But at the same time, close values of the quality metrics for different distribution models show that there is no unambiguous decision as to which model is considered the most appropriate. Speaking about the best model, it is better to take as it the most flexible one for a particular set of empirical data.

Key words: pine, forest plantations, tree distribution, tree diameter, distribution function.

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