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Designing Nelder wheel plots for tree density experiments

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Abstract The Nelder (Biometrics 18:283–307, 1962) wheel design allows a researcher to test multiple tree densities in a single plot. Because spatial relationships among planted trees are fundamental to a Nelder wheel, a researcher needs a specific set of layout parameters to establish a Nelder plot. While Nelder (Biometrics 18:283–307, 1962) provides calculus-based equations for determining the required layout parameters, the presentation focuses on derivation of these equations and not their application to forestry research. Other authors have outlined the design of Nelder plots for forestry research, but have done so using trigonometry-based equations. Existence of two layout methodologies in the literature is a source of confusion. In this paper, we present a straightforward means to determine the design parameters critical to the establishment of Nelder plots used within tree density research. The layout equations presented are expressed in terms that allow applied forestry researchers to easily answer the following question. Given the number and range of tree densities I want to evaluate, what are the required Nelder wheel layout parameters? Finally, we provide a step-by-step example of the design and installation of a Nelder plot for a scenario familiar to tree density research and discuss analysis of Nelder wheel experiments.

Keywords Experimental design · Tree spacing · Stand density · Tree growth

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