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COMPARISON OF DIFFERENT METHODS FOR SENSITIVITY ANALYSIS OF COMPOSTING MODELLING

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ABSTRACT Sensitivity analysis was used to optimize a numerical model of the composting process. Sensitivity analysis of composting models usually considers perturbation as a fixed decrease or increase of several individual parameters. In this study, the most sensitive combination of perturbations was found. Since compost is a complex system, interactions involving microbial growth parameters were the primary focus, such as maximum microbial growth rate or compost heat capacity, rather than the isolated effects of each perturbation. Instead of examining two discrete, lower and higher, values for each parameter, a continuum of perturbations was assumed. The study focused on small perturbations, limiting the sum of the squares of the perturbations to a chosen value. The perturbations on parameters were chosen in proportion to their initial values. Several methods were reviewed to find the maximum error in the hypersphere of perturbation. Available time and resources limited the amount of simulation, so a comprehensive experimental grid design was not realistic. Several optimization algorithms were explored in order to limit the amount of simulation required. The chosen error function had specific characteristics that allowed the use of specialized methods in this context. The maximum error was approximated through the first order partial derivatives of the function. An evaluation of the amount of simulation required was done to compare it to some common algorithm methods, and those methods are summarized and compared.

Keywords: Sensitivity analysis, Numerical model, Composting.