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Pragmatic methods for water and nutrient uptake in spatially-heterogeneous environments

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Pragmatic methods for water and nutrient uptake in spatially-heterogeneous environments

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Abstract: Most existing process-based crop-soil models consider soil variability only in the vertical dimension despite that it is well-known that lateral heterogeneity is substantial. Lateral heterogeneity includes variation in soil physical properties but also those induced by management. These types of heterogeneity can be transient, such as arising from fertiliser or excreta placement, or long-term, such as placement of fronds harvested from oil palm plantations in the same location year after year. Where the physical scale of the variation is smaller than the extent of the root zone of the plants it is necessary to take account of the lateral heterogeneity explicitly but few simple, or pragmatic methods, exist to do this. Here we present a new method to fill this gap. The method is based on explicitly modelling the lateral heterogeneity with the uptake from each of the regions calculated based on a Runge-Kutta integration. We will present the method and show its application in the context of oil palm plantations and urine patches in grazed pastures.

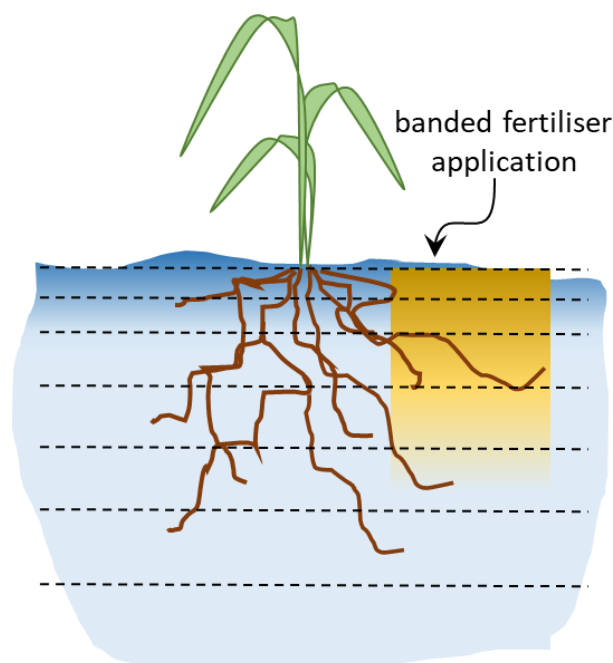


Figure 1. Diagram a typical lateral heterogeneity following a banded application of fertiliser of a row crop.

Keywords: spatial heterogeneity; non-uniform uptake; simulation modelling; mixed canopies.