Appendix 2: Supplemental figures

Supplemental movie M1: Dynamic simulation of a low and high branching maize phenotype. See figure 1 for further information. File supplied separately.

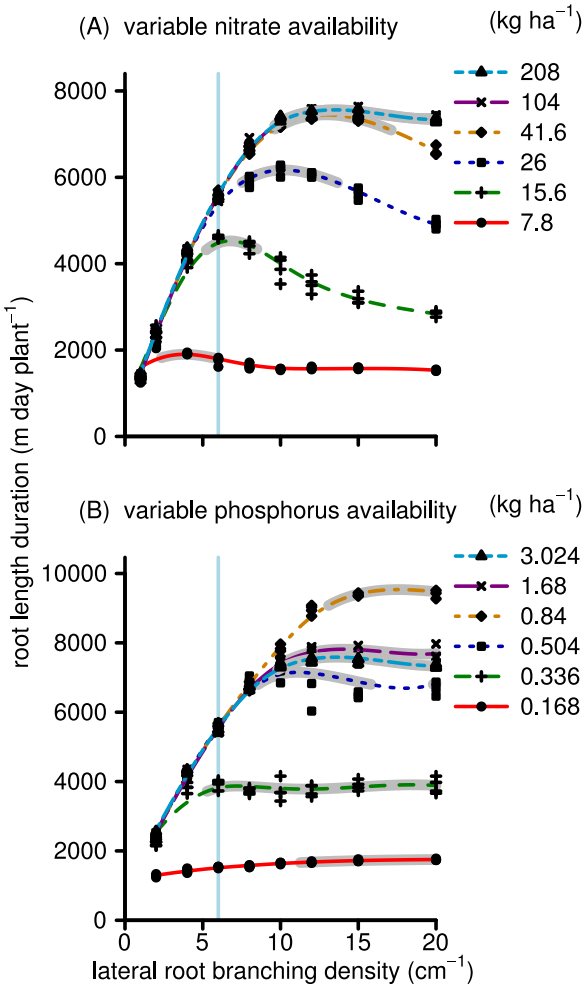

Figure S1: As in figure 2, but showing root length duration. Root length duration is the integral of the root length over time. The 104 kg N ha^{-1} scenario is partlyhidden behind the 208 kg N ha^{-1} scenario.

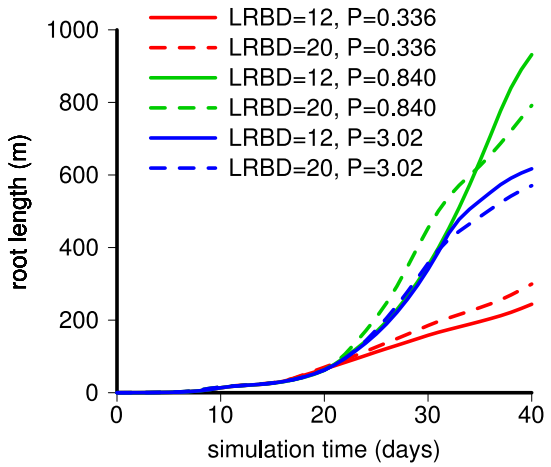

Figure S2: Development of root length over time for three phosphorus levels and 2 LRBD phenotypes. The high branching phenotypes can have more root length initially, but less later on.

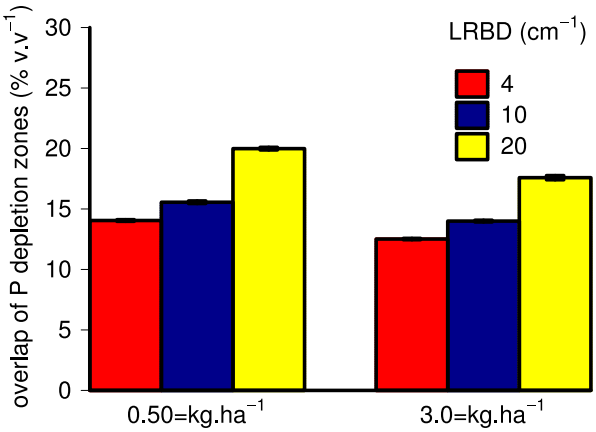

Figure S3: Overlap of phosphorus depletion zones estimated using rastering of the spatial domain. Depletion zones are defined as a cylindrical region around the roots with the outer boundary the radius where the phosphorus concentration is reduced to below 95% of the initial concentration when the root grew there. Estimated is the overlap of the cylindrical regions, including both overlap between roots of neighboring plants and roots of the same plant. Phosphorus availability (0.5 or 3.0 kg of PO_4 in solution) does not affect the overlap, and increasing LRBD increases the overlap only slightly. Most of the overlap occurs when lateral roots have to grow outside the depletion zone of their parent root (data not shown). Small error bars show standard error of mean (n=4).

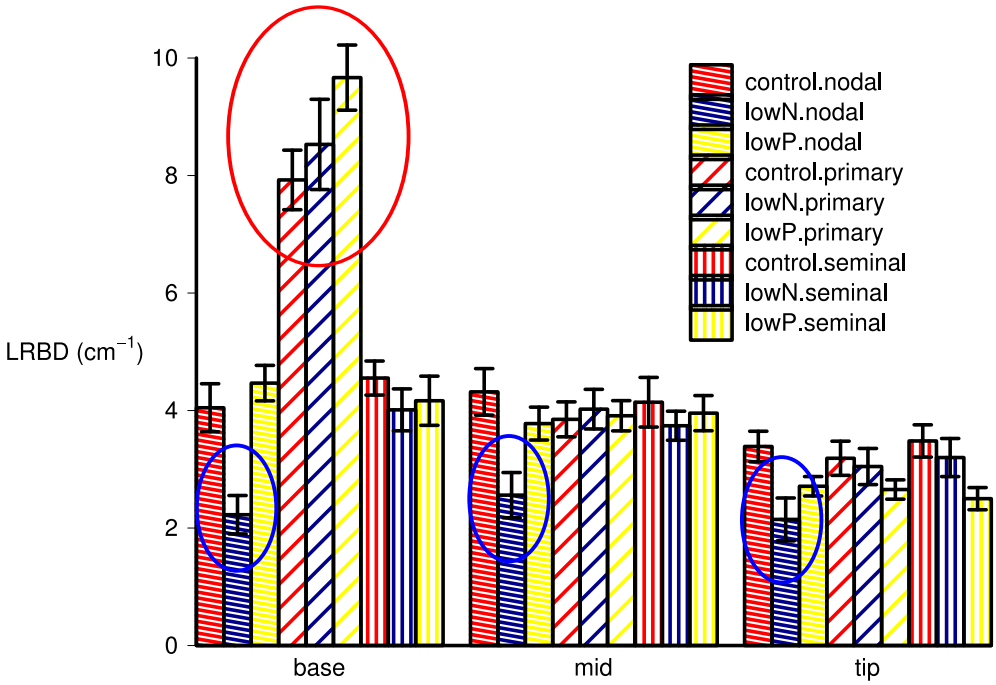

Figure S4: LRBD for different root classes and at different positions in the root system as measured on 4 week old maize plants grown in 20 liter rhizotron boxes filled with a 1:1 (v/v) peat-basalt split mixture. Each bar represents the mean of 18 counted root segments (6 genotypes * 3 repetitions). Error bars show standard error of means. The experiment included 3 nutrient levels: control=fertilized with complete nutrient solution, low N=no N fertilization, low P=no P fertilization. We counted the number of branches along a 5 cm root segment taken from a randomly chosen nodal, seminal and primary root. Of each root three segments were counted: base=from the base of the root 5 cm down, mid=in the middle of the root 5 cm, tip=5 cm from the first emerged lateral up. The LRBD at the base of the primary root (circled red) is significantly ($\alpha = 0.05$) denser than at other locations while the LRBD for low N nodal roots (circled blue) was significantly ($\alpha = 0.05$) smaller than the other locations.

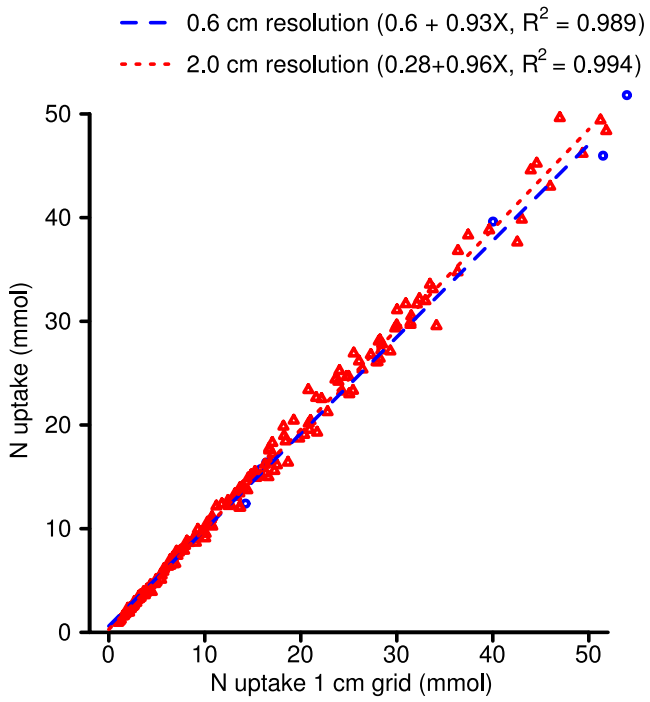

Figure S5: Correlation between the results when simulating the LRBD nitrate runs with a 1*1*1 cm regular spaced finite element mesh, and a 0.6*0.6*0.6 (blue) or 2.0*2.0*2.0 (red) cm mesh. The fitted regression line are given in brackets. Expected fit is Y=X.

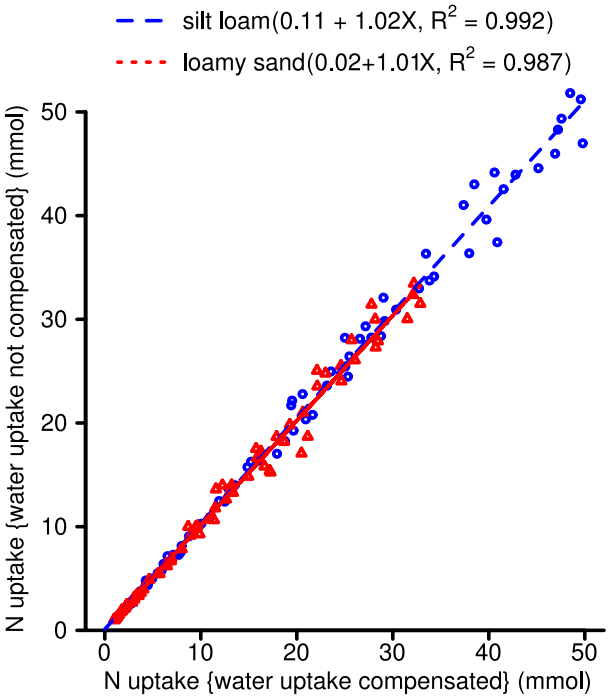

Figure S6: As in S5 but here showing the fit between two ways of simulating water uptake, either without compensation between roots in dryer and wetter regions, or with compensation. The figure shows that compensatory water uptake did not influence nitrate uptake significantly and that the much faster simulation of non-compensatory water uptake in this study was justified.