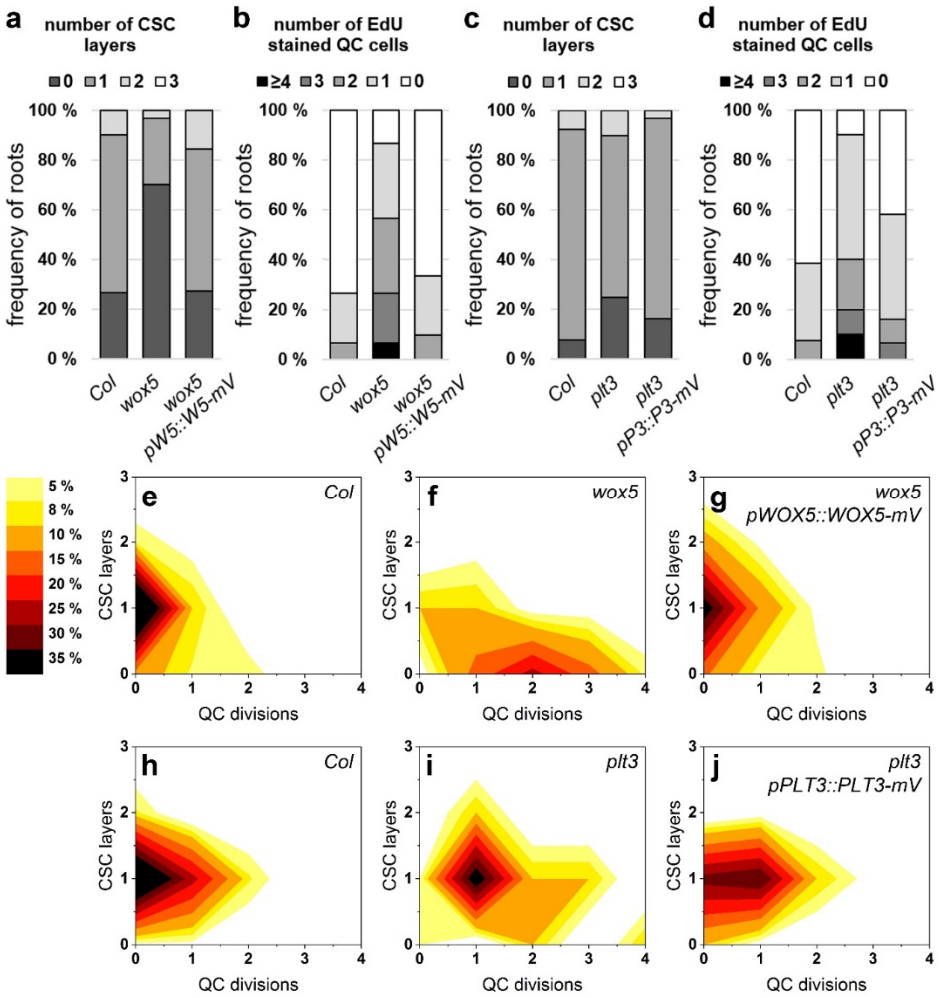
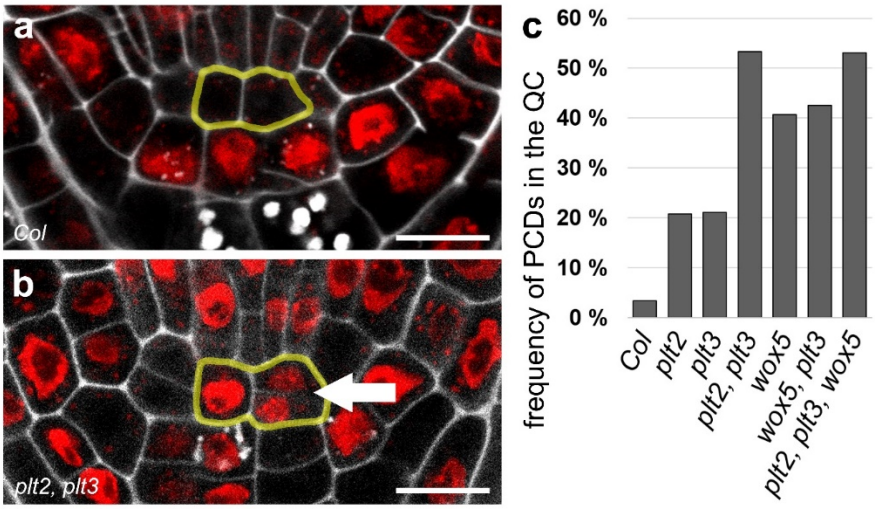
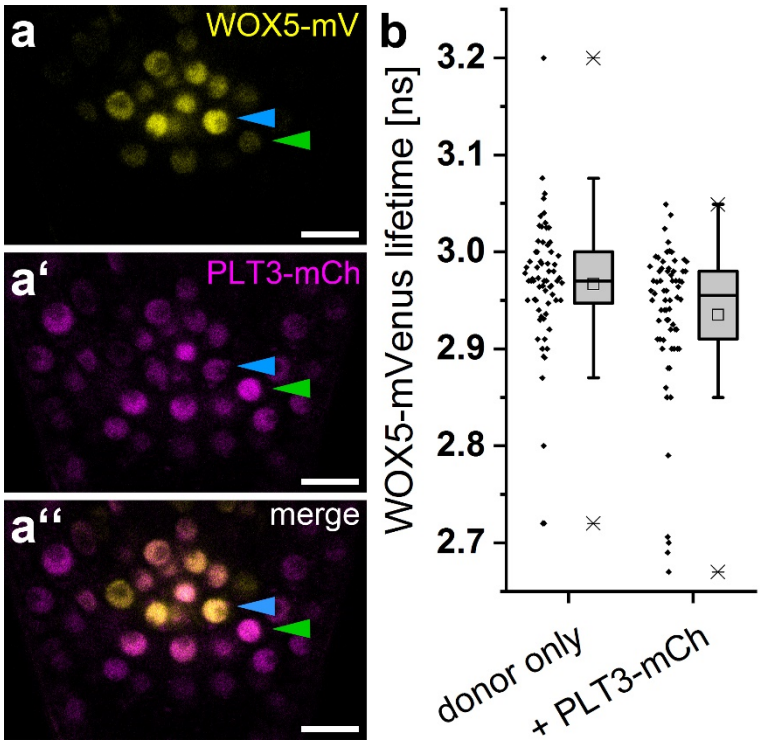


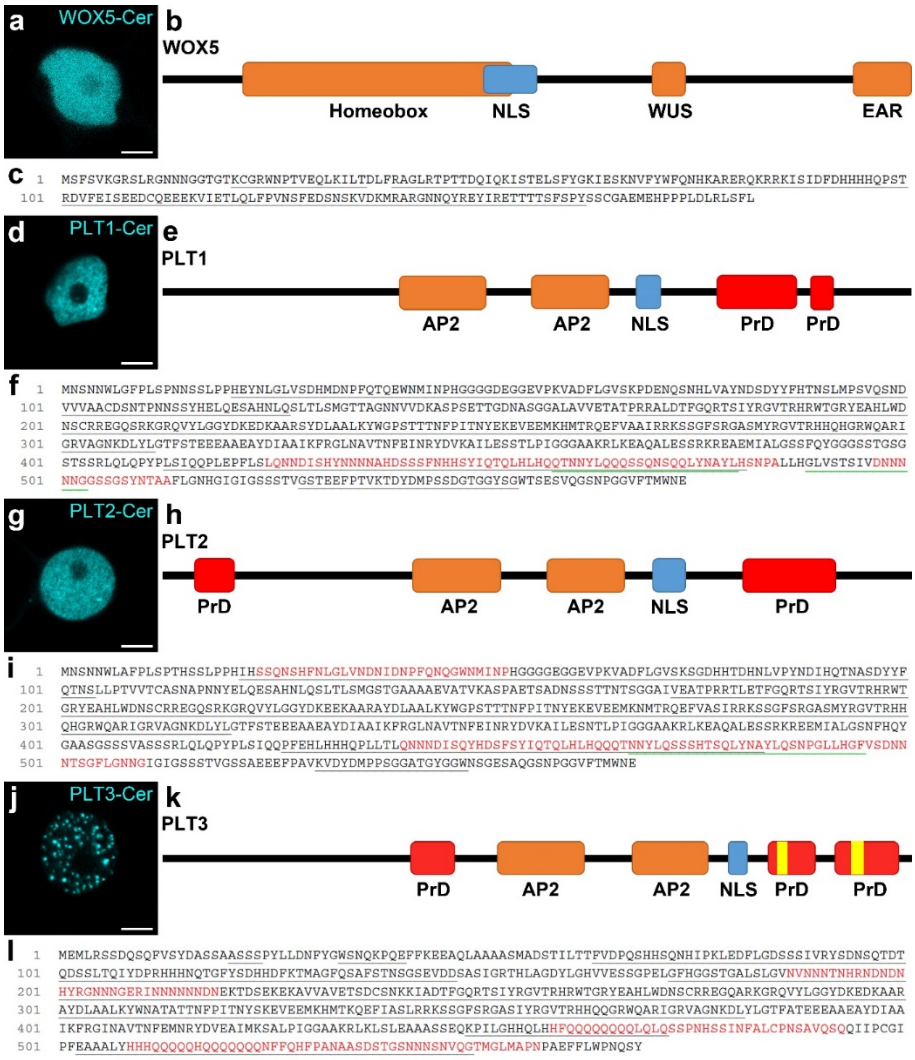
Supplementary Fig. 1 | Expression of WOX5-mVenus and PLT3-mVenus rescues the respective mutant phenotypes. SCN staining was performed for two separate rescue experiments in *Arabidopsis thaliana* seedlings. The staining was done in either the *wox5* or *plt3* mutant background expressing either WOX5-mV or PLT3-mV driven by their endogenous promoters in the respective mutant backgrounds as well as in *Col* wildtype for both experiments. **a-d**, Analyses of the SCN staining for CSC (**a,c**) or QC division (**b,d**) phenotypes. The frequencies of roots showing 0-3 CSC layers or 0-4 dividing QC cells are plotted as bar graphs. **e-f**, The combined results of the SCN staining are shown as 2D plots. Number of CSC layers are shown on the y axis and the QC division phenotype is shown on the x axis. The darker the colour, the more roots show the respective phenotype (see colour gradient on the left indicating the frequencies). Number of analysed roots n = 26-51. EdU = 5-ethynyl-2´-deoxyuridine; CSC = columella stem cell; QC = quiescent centre; W5 = WOX5, P3 = PLT3.



Supplementary Fig. 2 | *plt* and *wox5* mutants show more periclinal cell divisions in the QC. a, Representative figure of an *Arabidopsis* wildtype root SCN staining. **b,** Representative figure of an *Arabidopsis plt2, plt3* double mutant root SCN staining showing a periclinal cell division (PCD) in the QC (arrow). **a,b** QC cells are outlined in yellow. Scale bars represent 10 µm. **b**, Analysis of the PCD phenotype. The frequency of roots (in percent) showing at least one PCD in the QC is plotted as a bar graph. Number of analysed roots n = 77-146. PCD = periclinal cell division.



Supplementary Fig. 3 | WOX5 does not interact with PLT3 in the *Arabidopsis* root. a-a’, Representative image of the SCN in a lateral root of an *Arabidopsis* reporter line expressing WOX5-mV (**a**) and PLT3-mCh (**a’**) driven by their respective endogenous promoters. The TFs localize to overlapping domains (**a’’**). Blue arrowheads mark QC cells, green arrowheads mark CSCs. **b**, Fluorescence Lifetime Imaging (FLIM) results of experiments performed in *Arabidopsis thaliana* expressing either only WOX5-mV (donor-only) or both WOX5-mV and PLT3-mCh driven by their respective endogenous promoters. Donor fluorescence lifetimes in ns are summarized in combined scatter and box plots. Number of measurements n = 67-68. mV = mVenus; mCh = mCherry; SCN = stem cell niche.



Supplementary Fig. 4 | Subnuclear localization and PrD prediction of WOX5, PLT1, PLT2 and PLT3. a,d,g,j, (Sub-)nuclear localisation of WOX5-Cer (**a**), PLT1-Cer(**d**), PLT2-Cer (**g**) and PLT3-Cer (**j**) in transiently expressing *N. benthamina* epidermal cells. Scale bars represent 5 µm. **b,e,h,k**, schematic representation of WOX5 (**b**), PLT1 (**e**) PLT2 (**h**) and PLT3 (**k**) protein domains. The areas in red are predicted prion-like domains (PrDs), analysed using the PLAAC prediction tool. Yellow areas are polyQ stretches in the PLT3 amino acid sequence. **c,f,i,l**, Protein sequences of WOX5 (**c**) PLT1 (**f**), PLT2 (**i**) and PLT3 (**l**). The red highlighted sequences are the predicted prion-like domains (PrDs). Cer = Cerulean fluorescent protein; PrD = prion-like domain; EAR = Ethylene-responsive binding factor-associated repression domain; WUS = WUSCHEL box; AP2 = APETALA2 domain; NLS = nuclear localization signal.

Supplementary movie 1 | Dynamic formation of nuclear bodies in a PLT3-mVenus expressing LRP. The video shows a developing lateral root in an *Arabidopsis thaliana* plant expressing mVenus tagged PLT3 driven by the endogenous promoter (pPLT3::PLT3 mVenus) over 18 hours. Scale bar represents 25 μm.