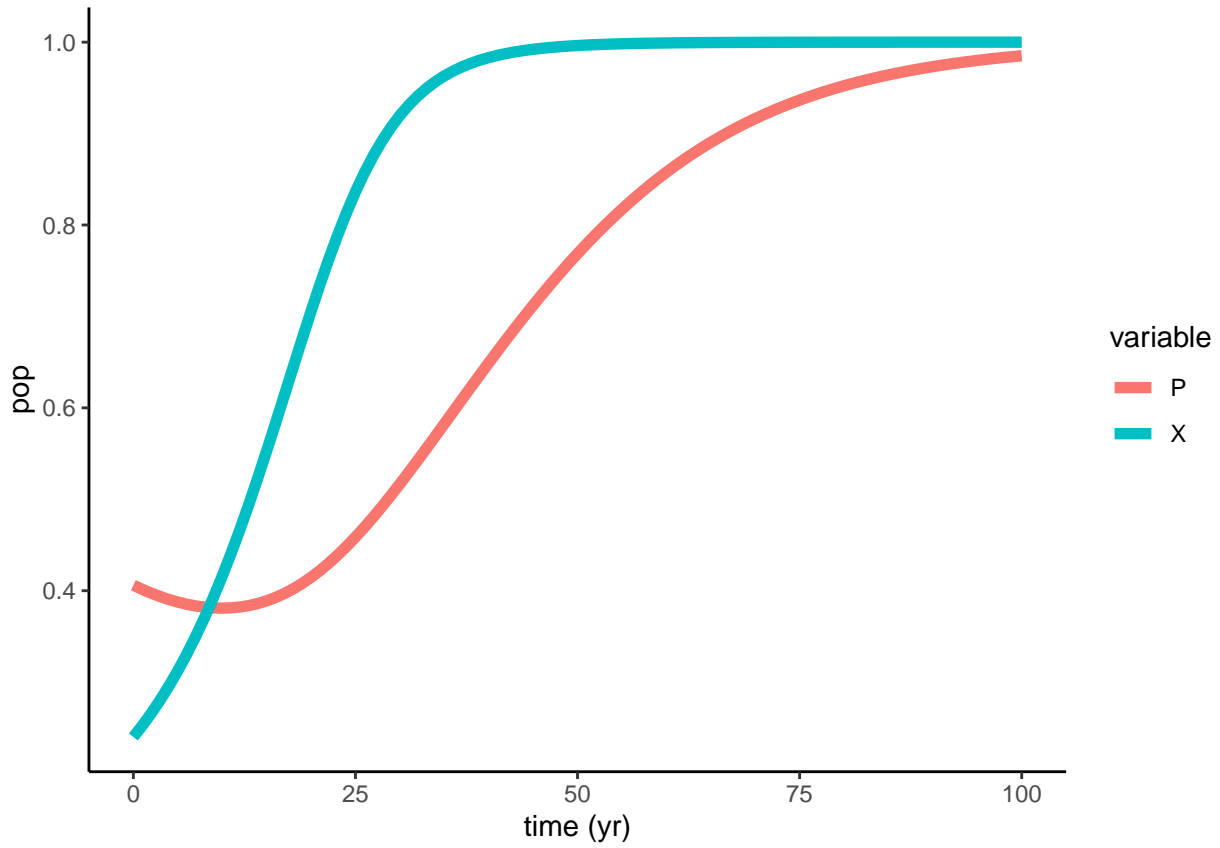# BauchModel_2

Sophie Wulfing

2022-11-08

Figure 1: Original Bauch Model

See derivation in notes but this is the new equations (still unsure about interaction terms):

$\frac{dP_1}{dt} = r_1 P_1 (1 - P_1) - \frac{h_1 * P_1 (1 - X_1)}{P_1 + s_1} + \rho_1 * \frac{P_2 - P_1}{2}$

$\frac{dX_1}{dt} = k_1 X_1 (prop_1 - X_1) X_2 (prop_2 - X_2)[\frac{1}{P_1 + c_1} - w_1 + d_1(2X_1 - prop_1) + d_2(2X_2 - prop_2)]$

$\frac{dP_2}{dt} = r_2 P_2 (1 - P_2) - \frac{h_2 * P_2 (1 - X_2)}{P_2 + s_2} + \rho_2 * \frac{P_1 - P_2}{2}$

$\frac{dX_2}{dt} = k_1 X_1 (prop_1 - X_1) X_2 (prop_2 - X_2)[\frac{1}{P_2 + c_2} - w_2 + d_1(2X_1 - prop_1) + d_2(2X_2 - prop_2)]$
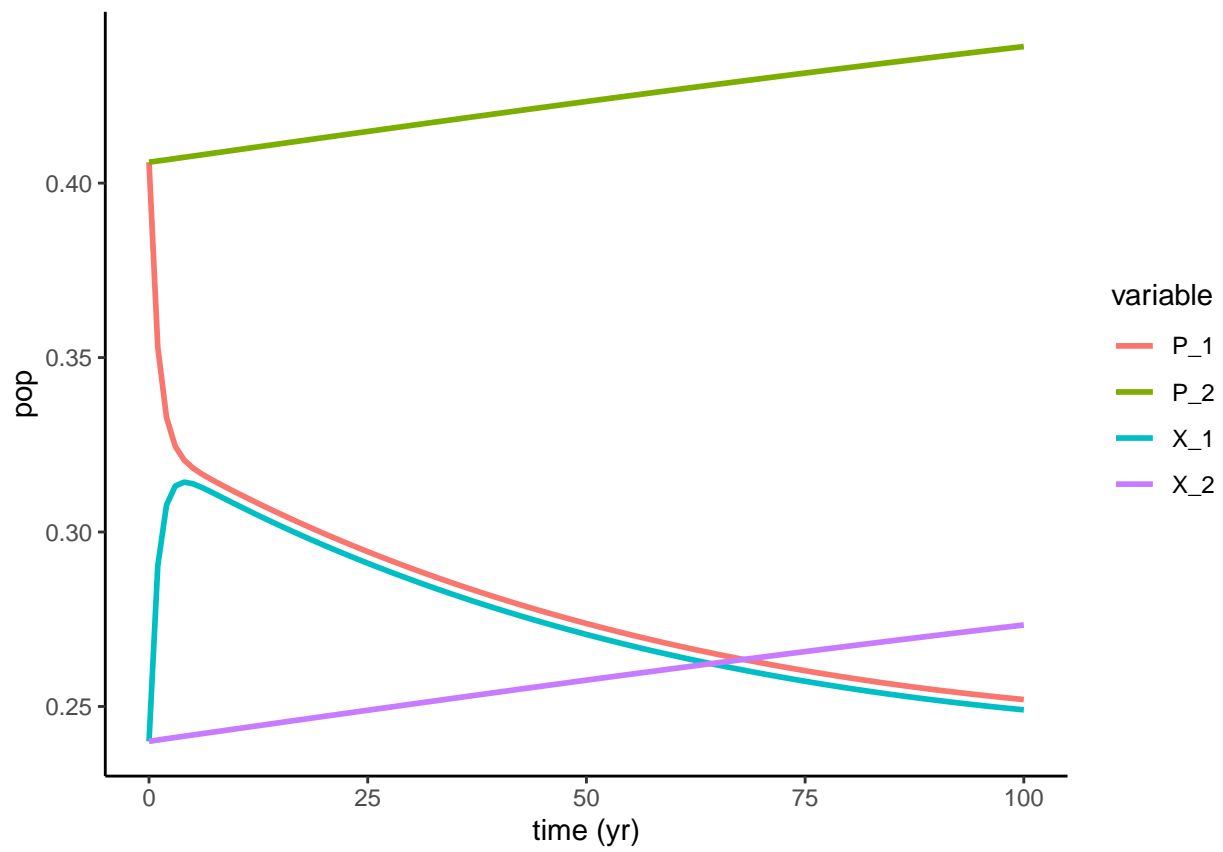
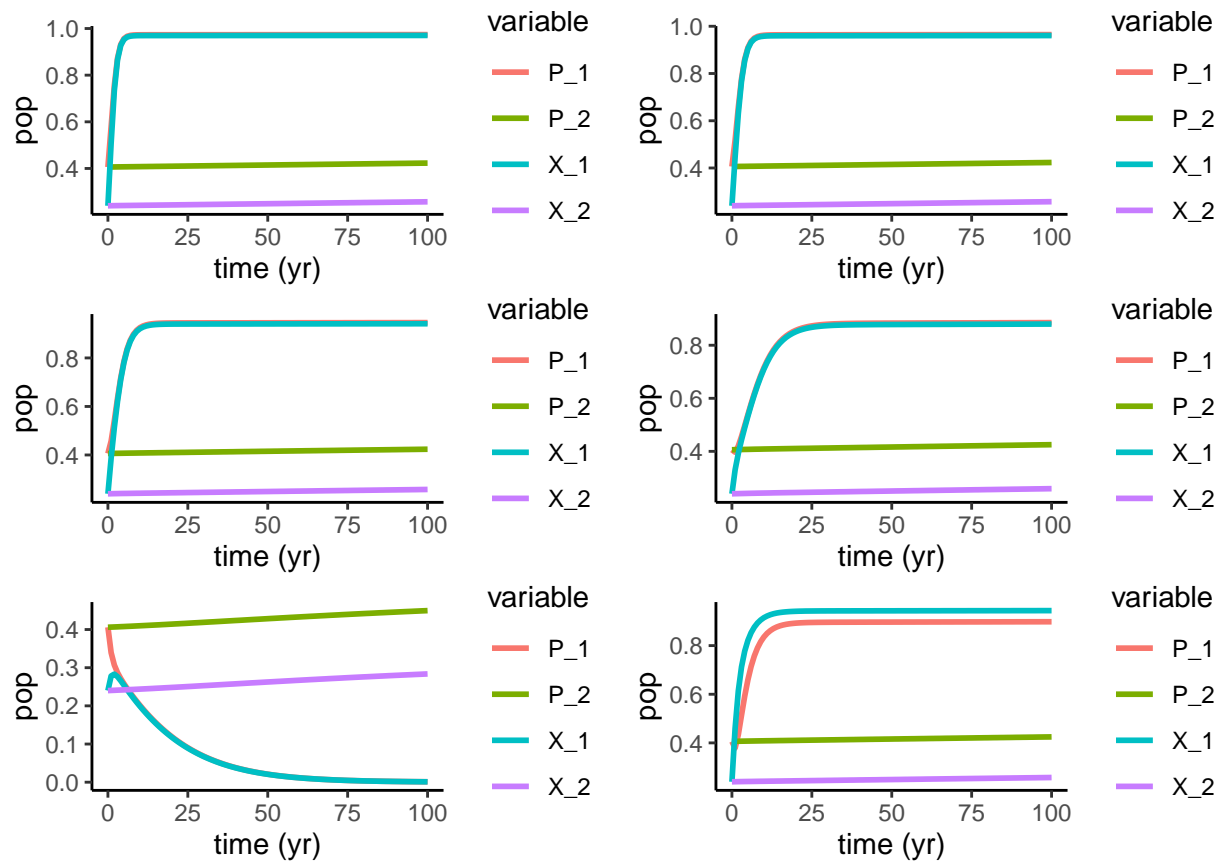Figure 2: New Model with default paramters
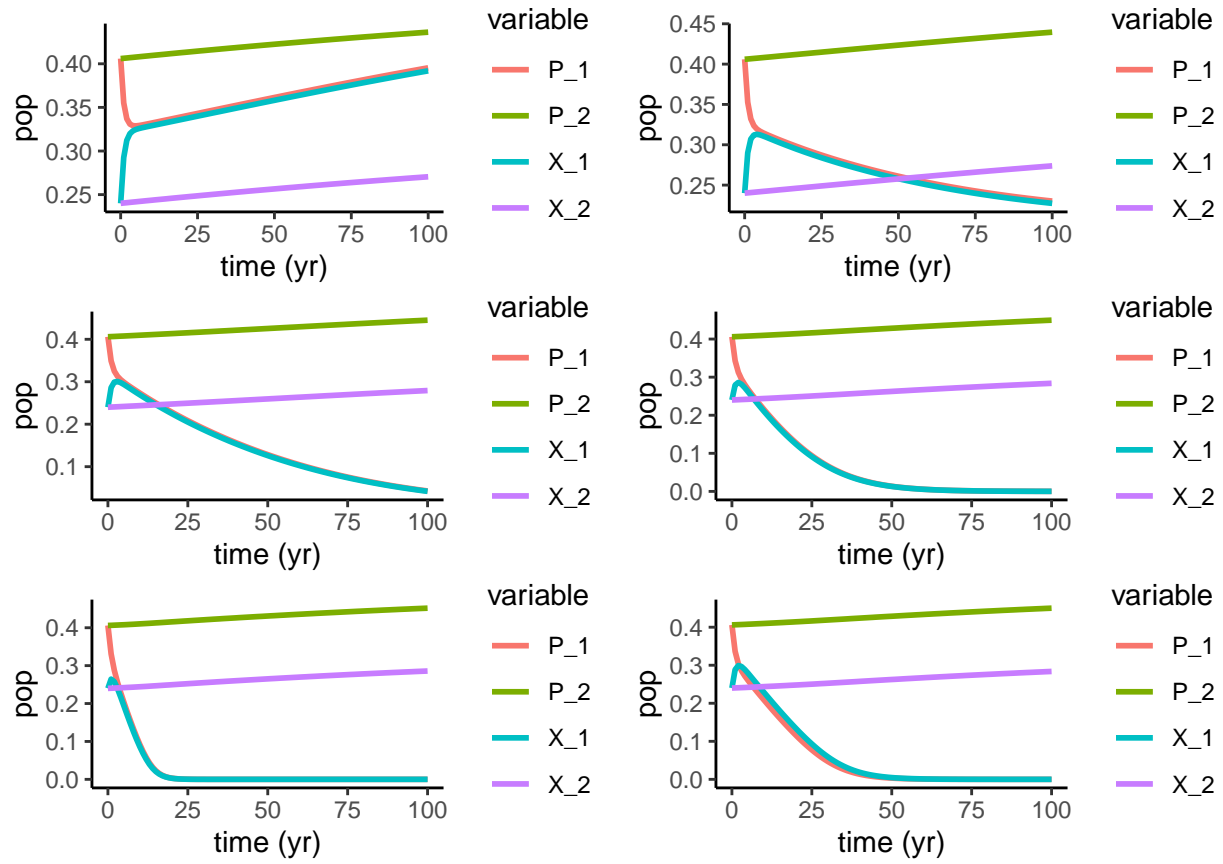
Figure 3: R - Net growth/fecundity, range 0 to 1
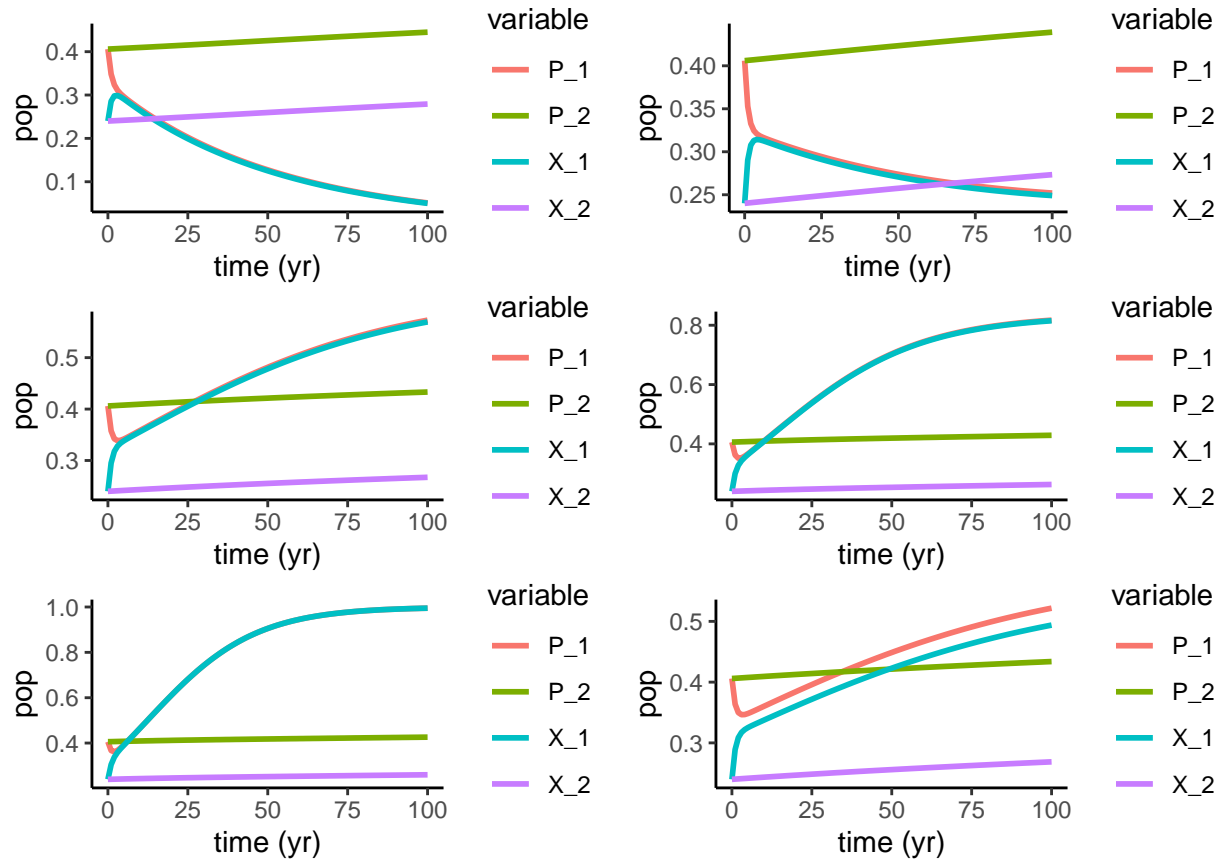
3

Figure 4: S - supply and demand, range 0.1 to 1

Figure 5: h - Harvesting efficiency, range 0 to 0.1. Note, default is .075
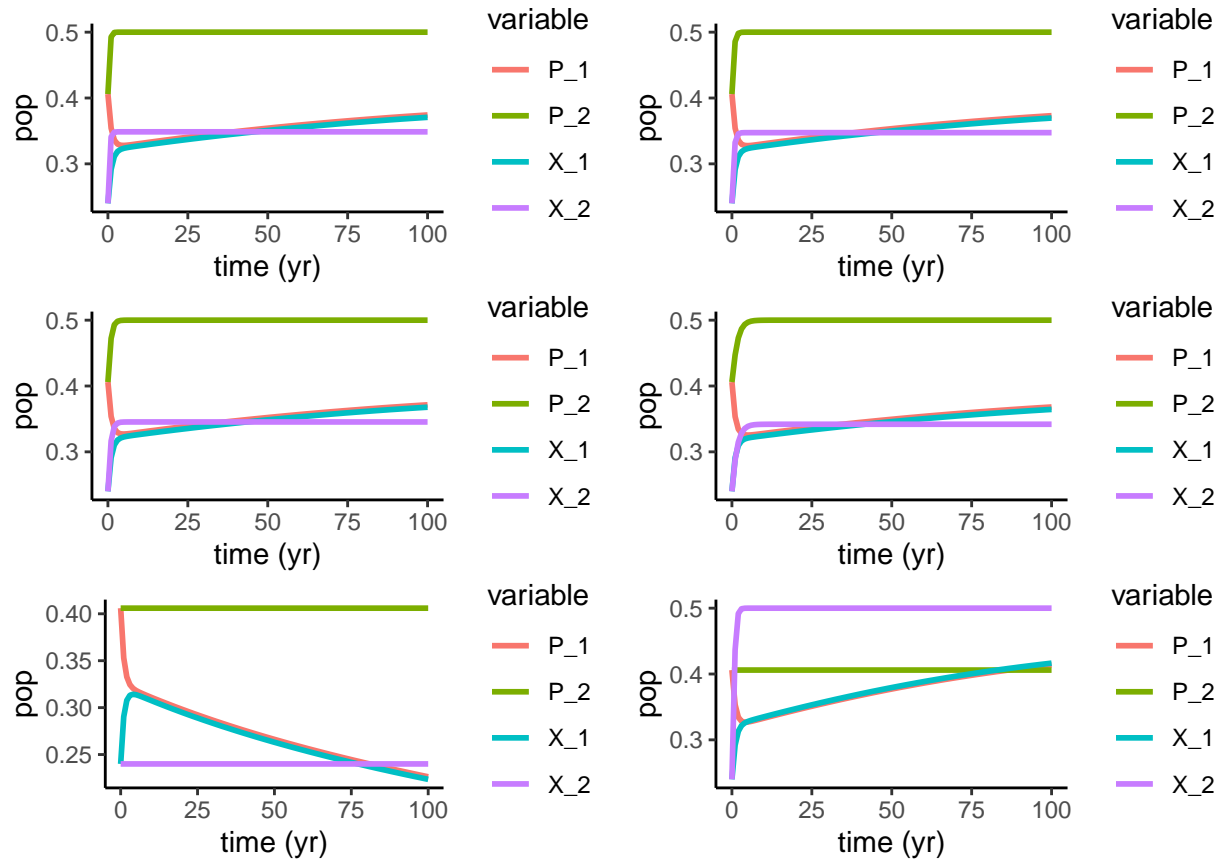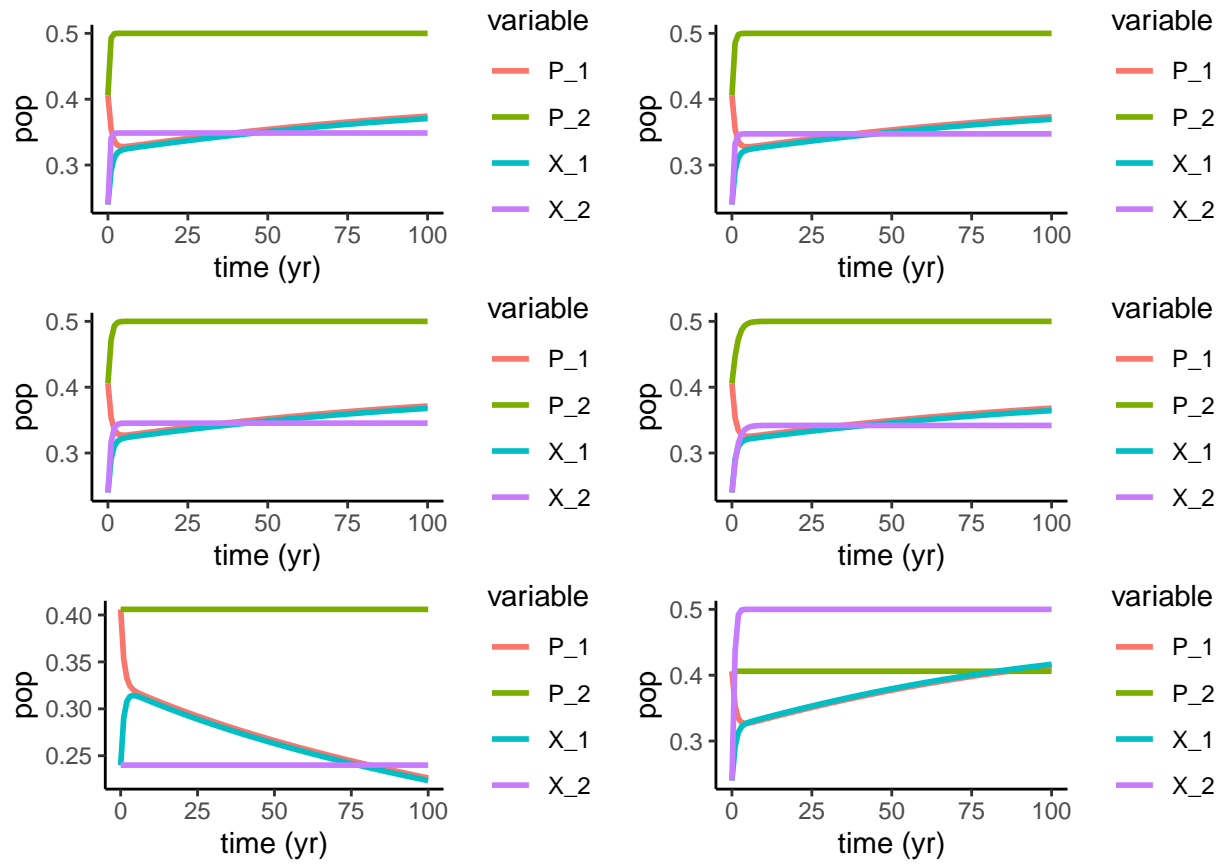
Figure 6: K - Social learning rate 0 to 100

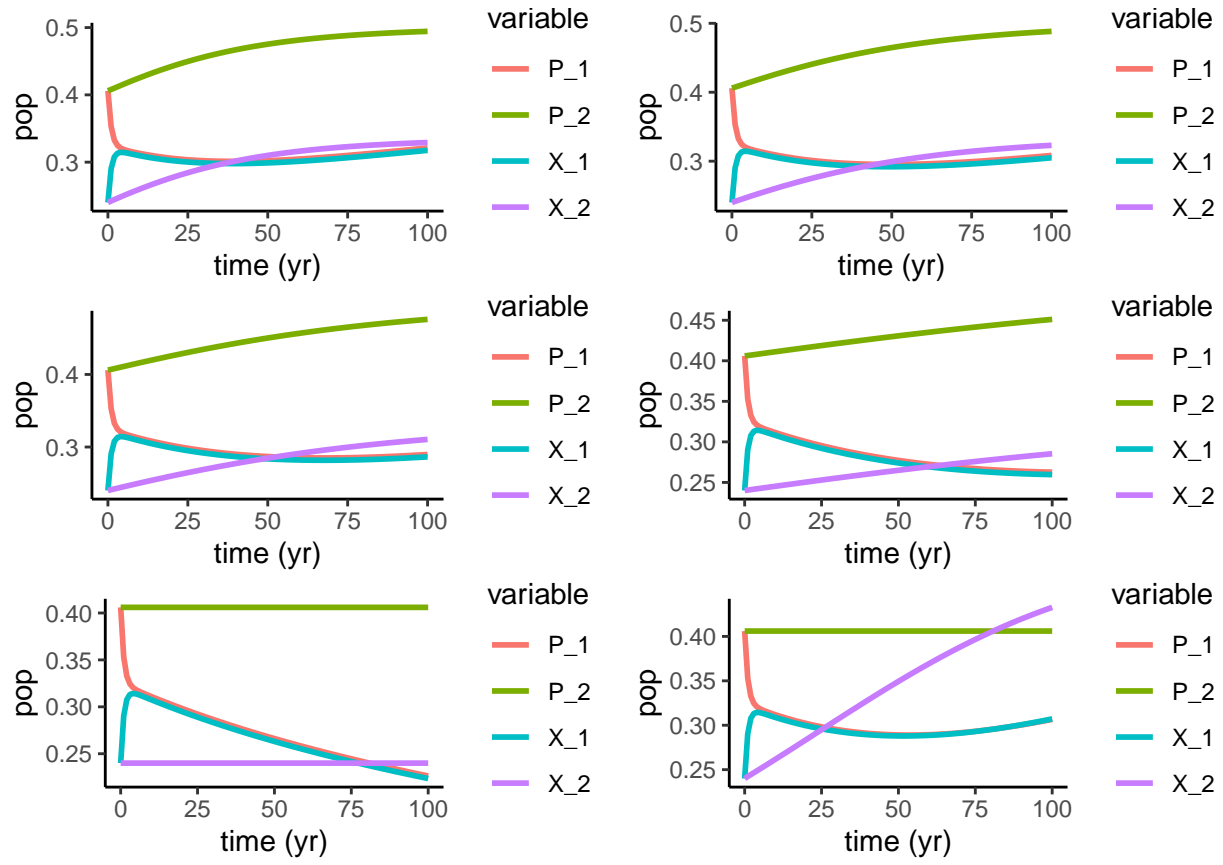Figure 7: K - Social learning rate 0 to 100
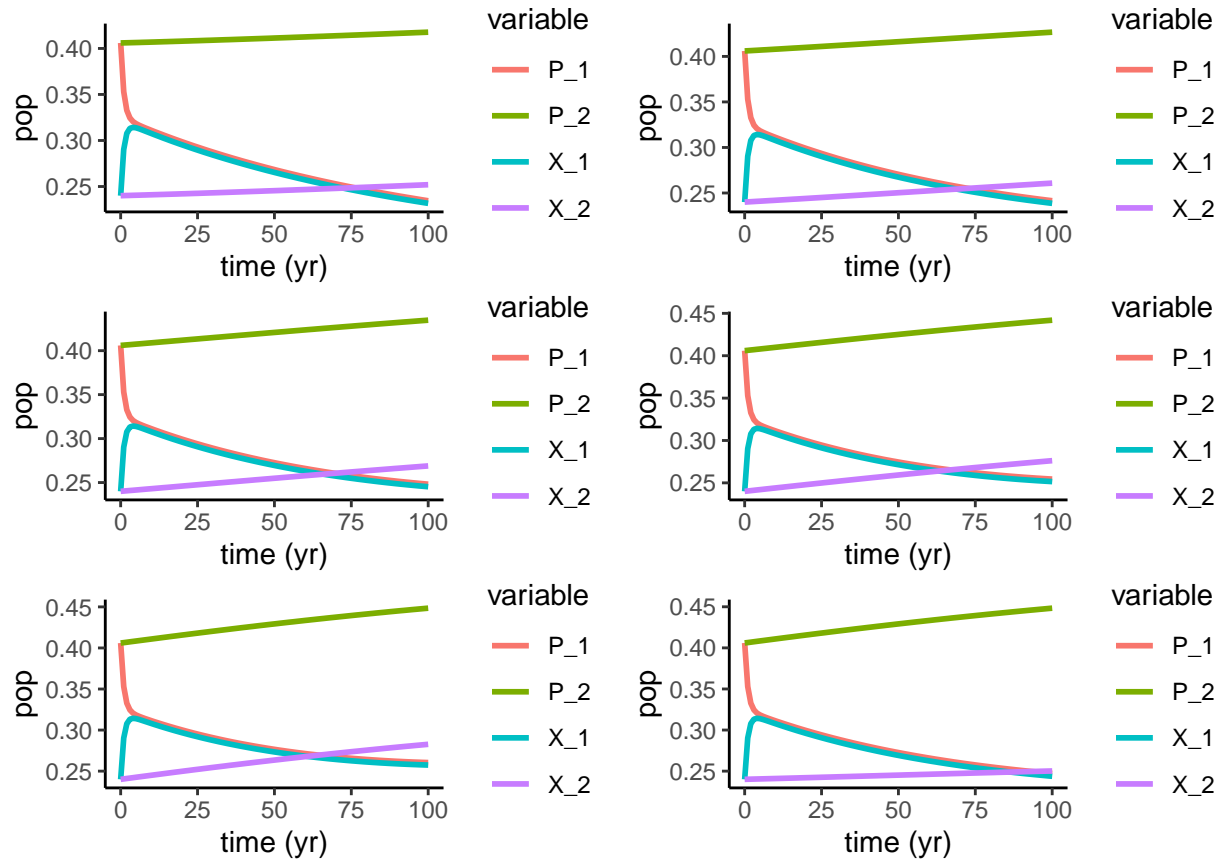
Figure 8: K - Social learning rate 0 to 1
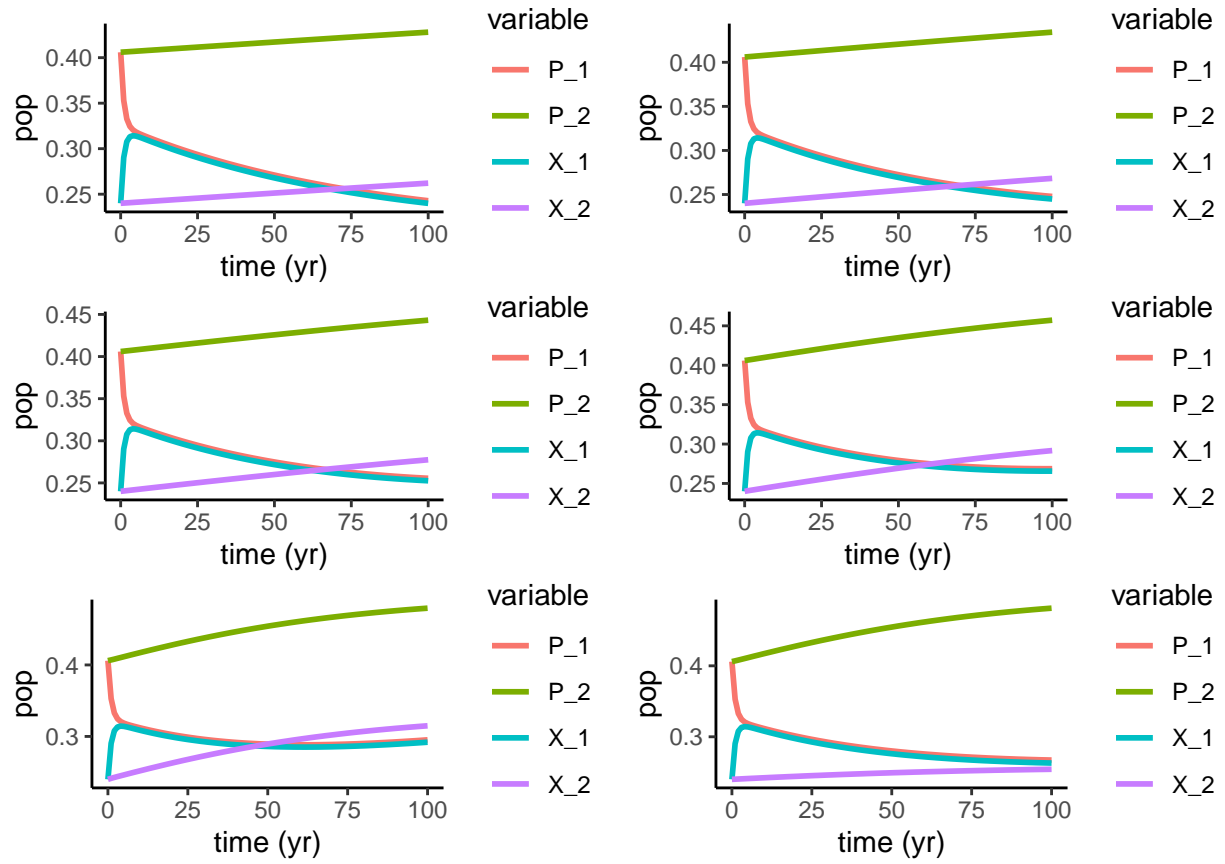
8

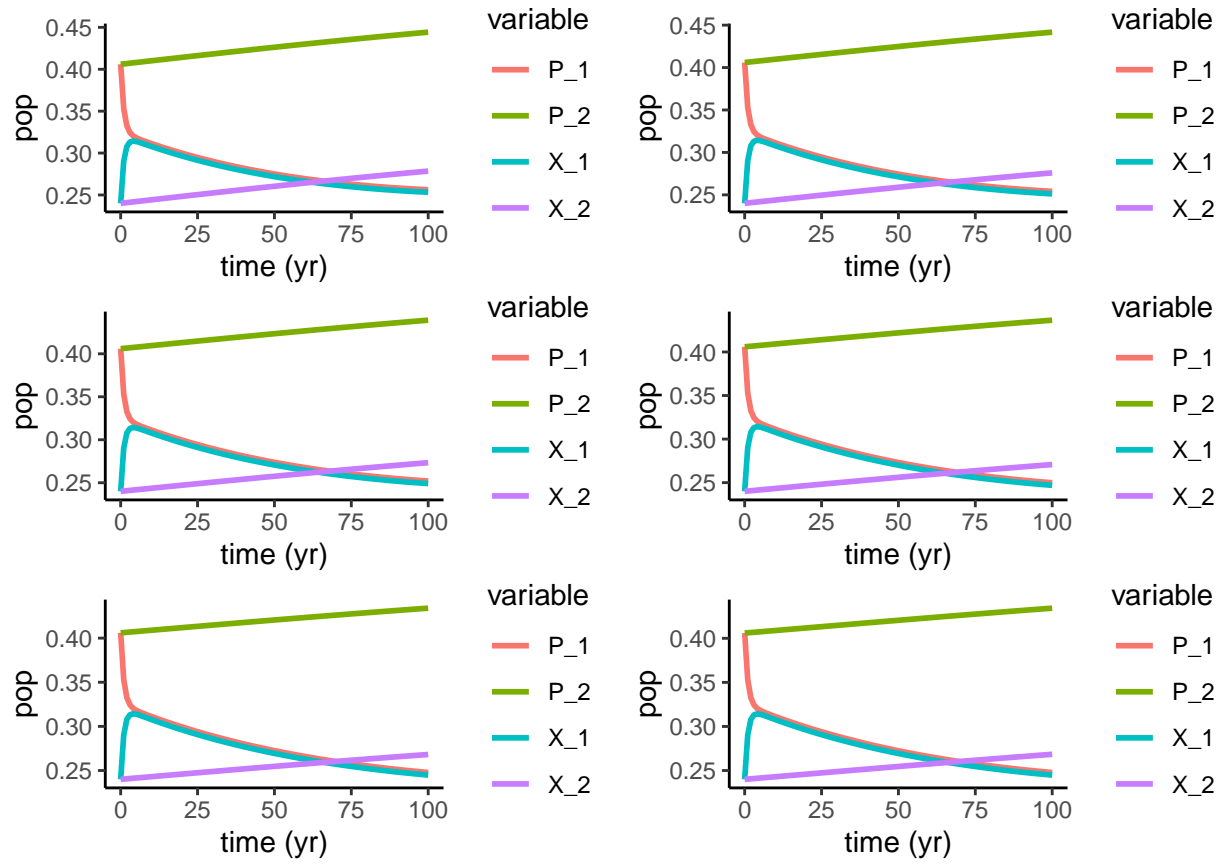Figure 9: w - conservation costs

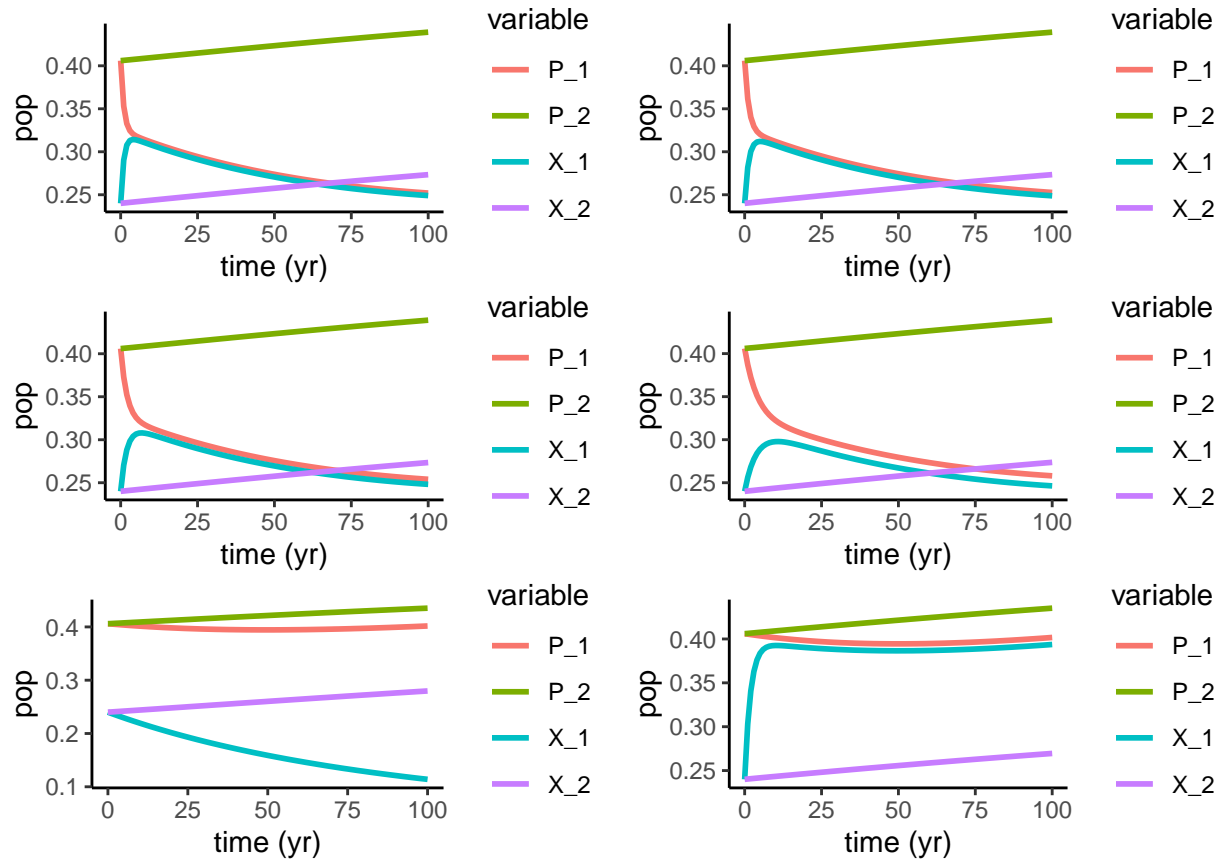Figure 10: c - rarity valuation param

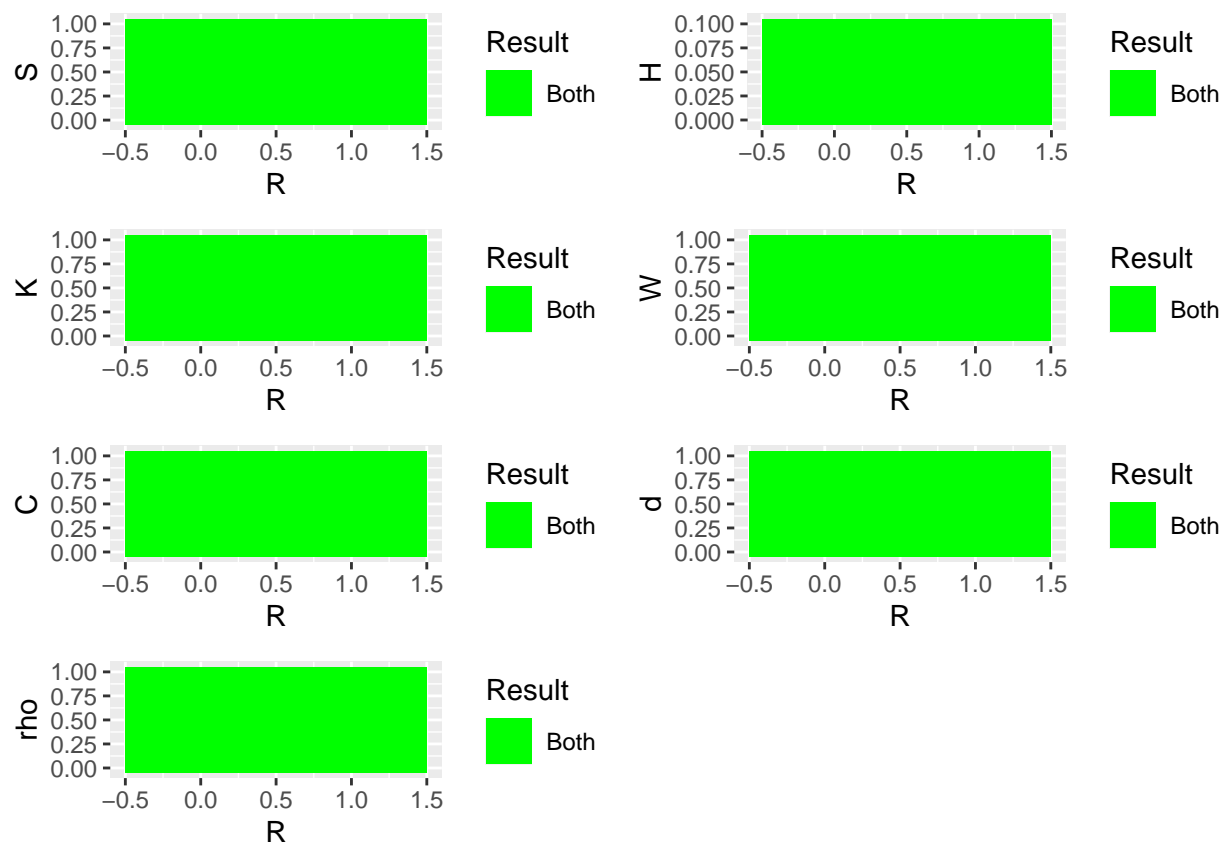Figure 11: d - social norm strength

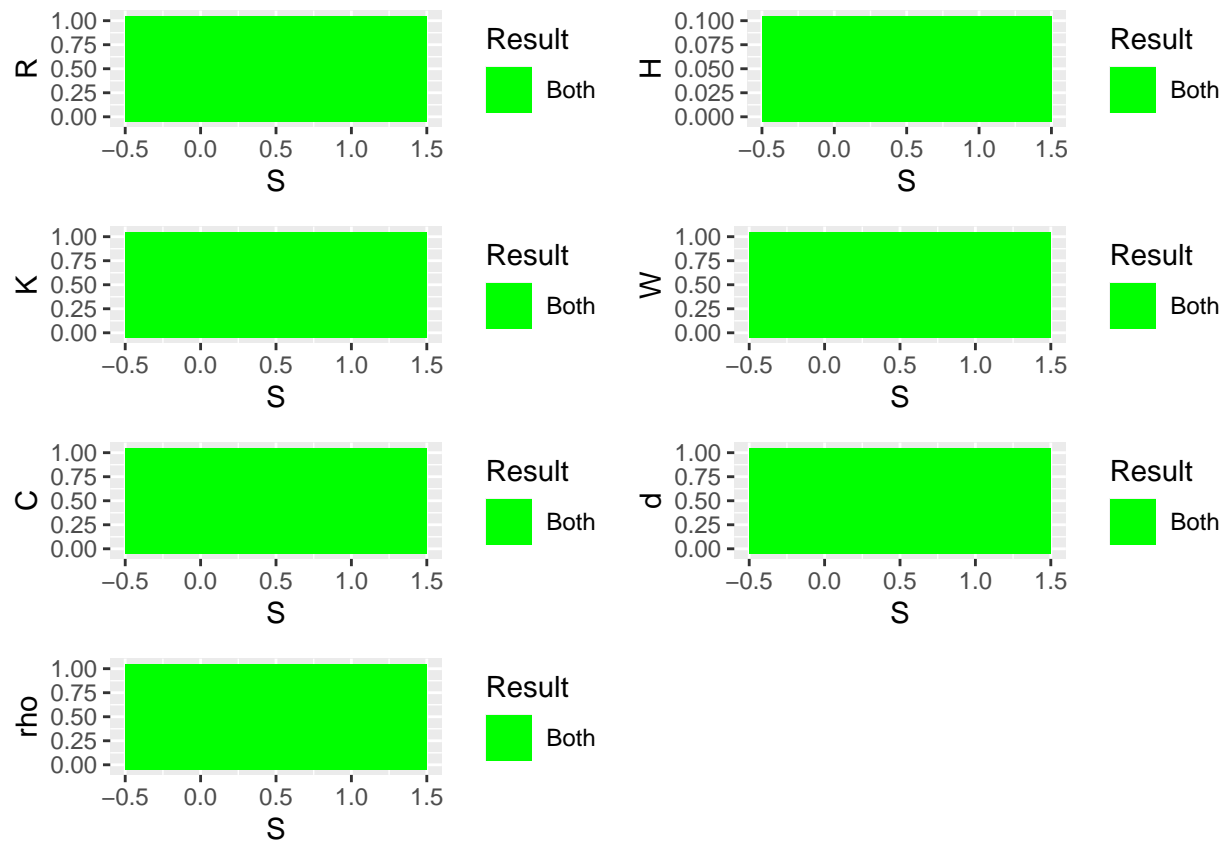Figure 12: roh - fish diffusion

Figure 13: R parameter planes
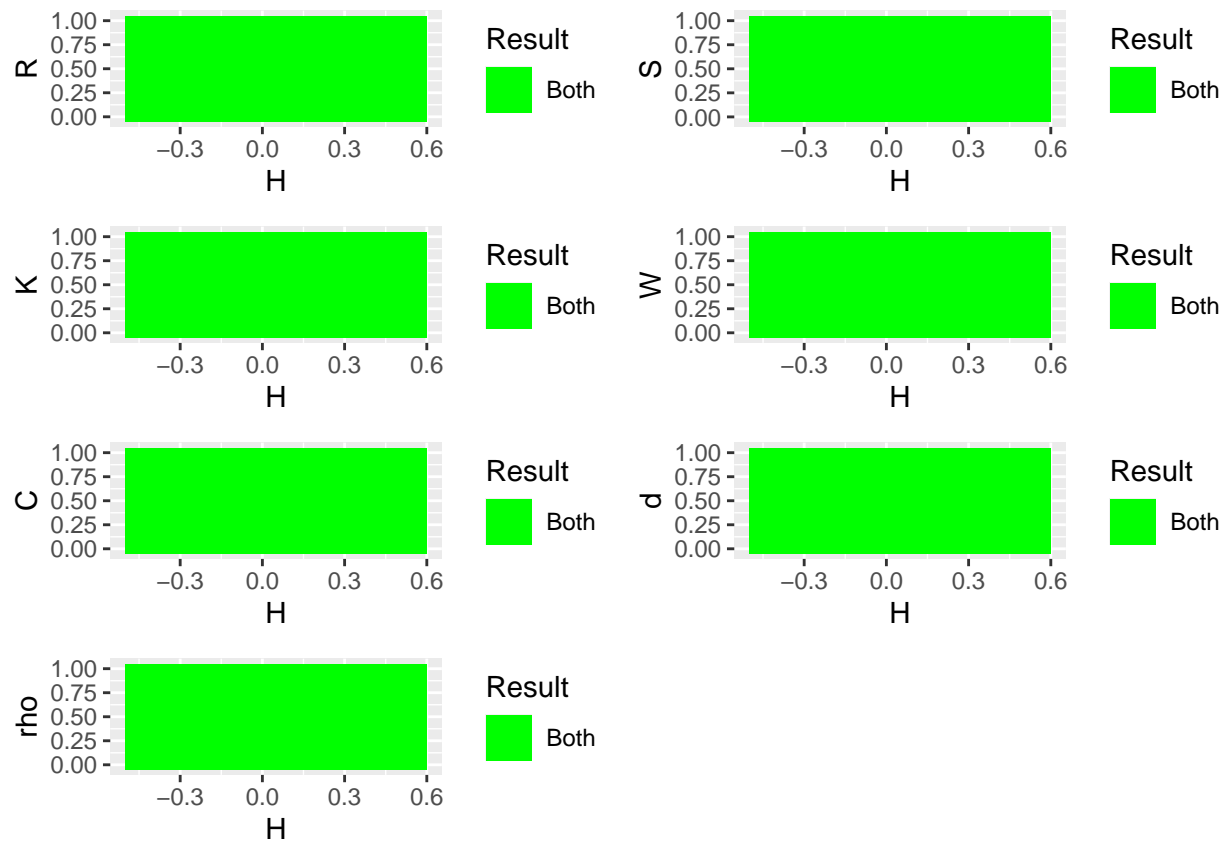
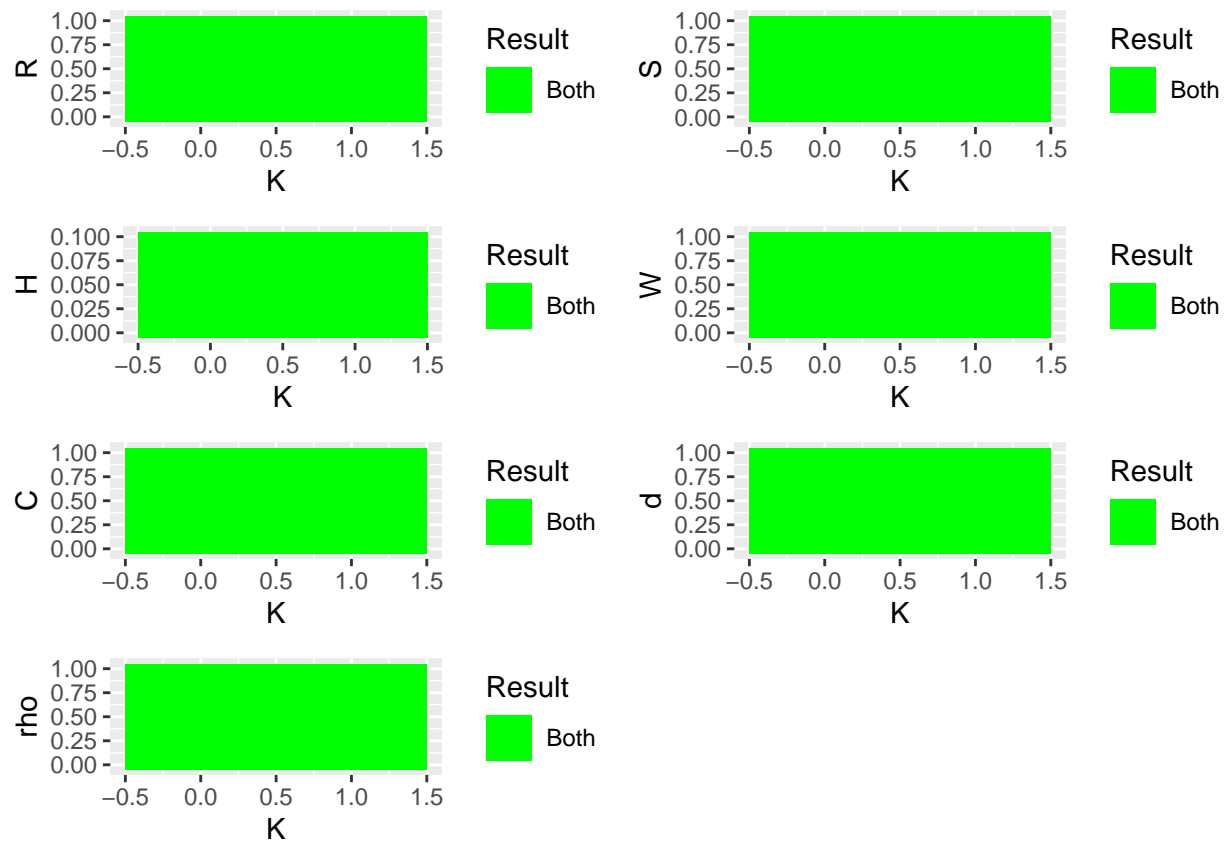Figure 14: S parameter planes

Figure 15: h parameter planes
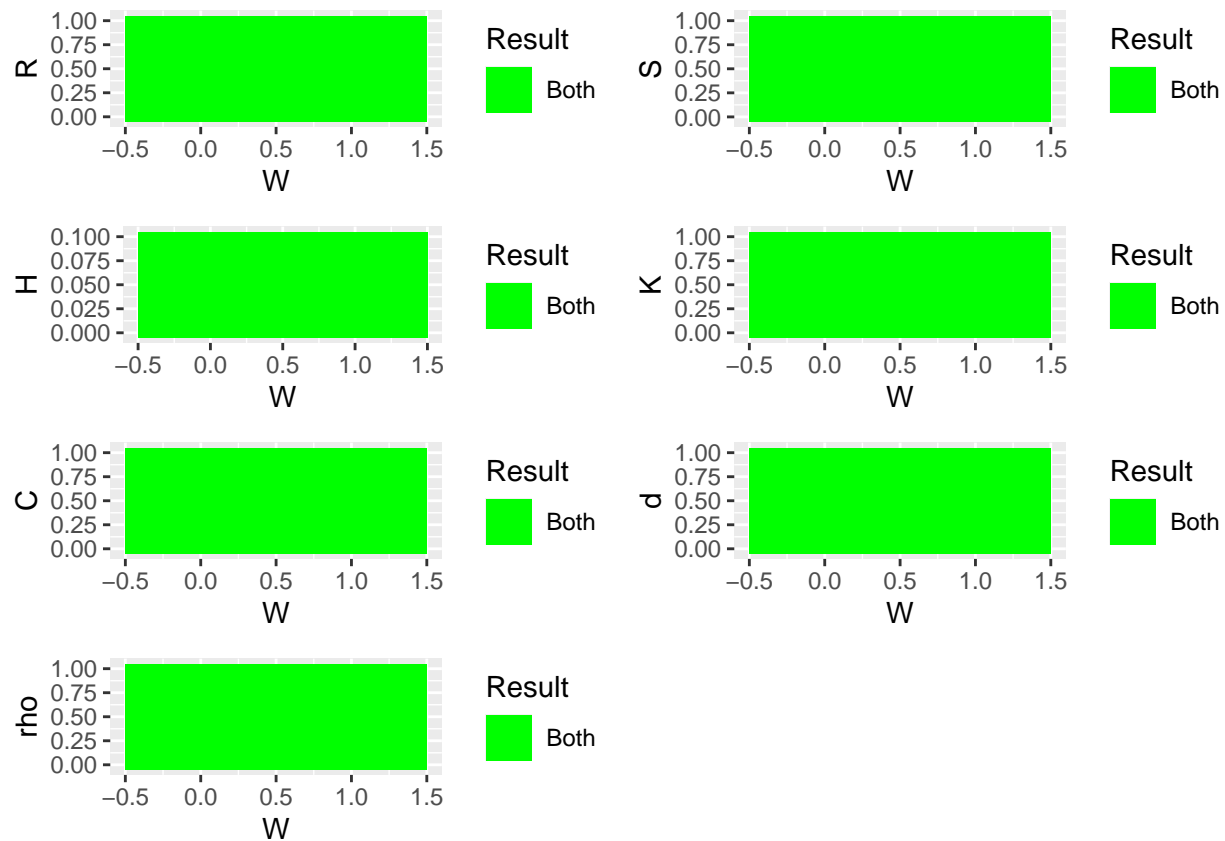
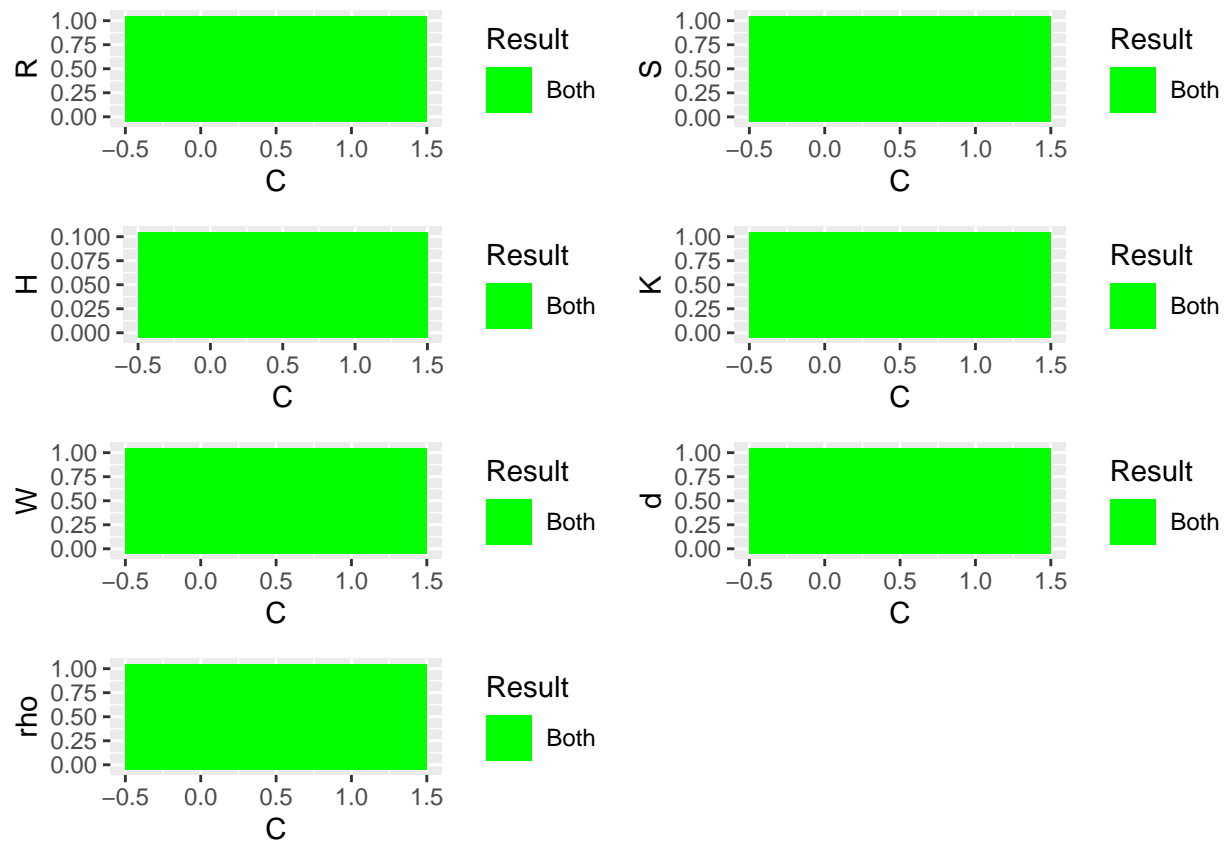Figure 16: K parameter planes ranging from 0-1

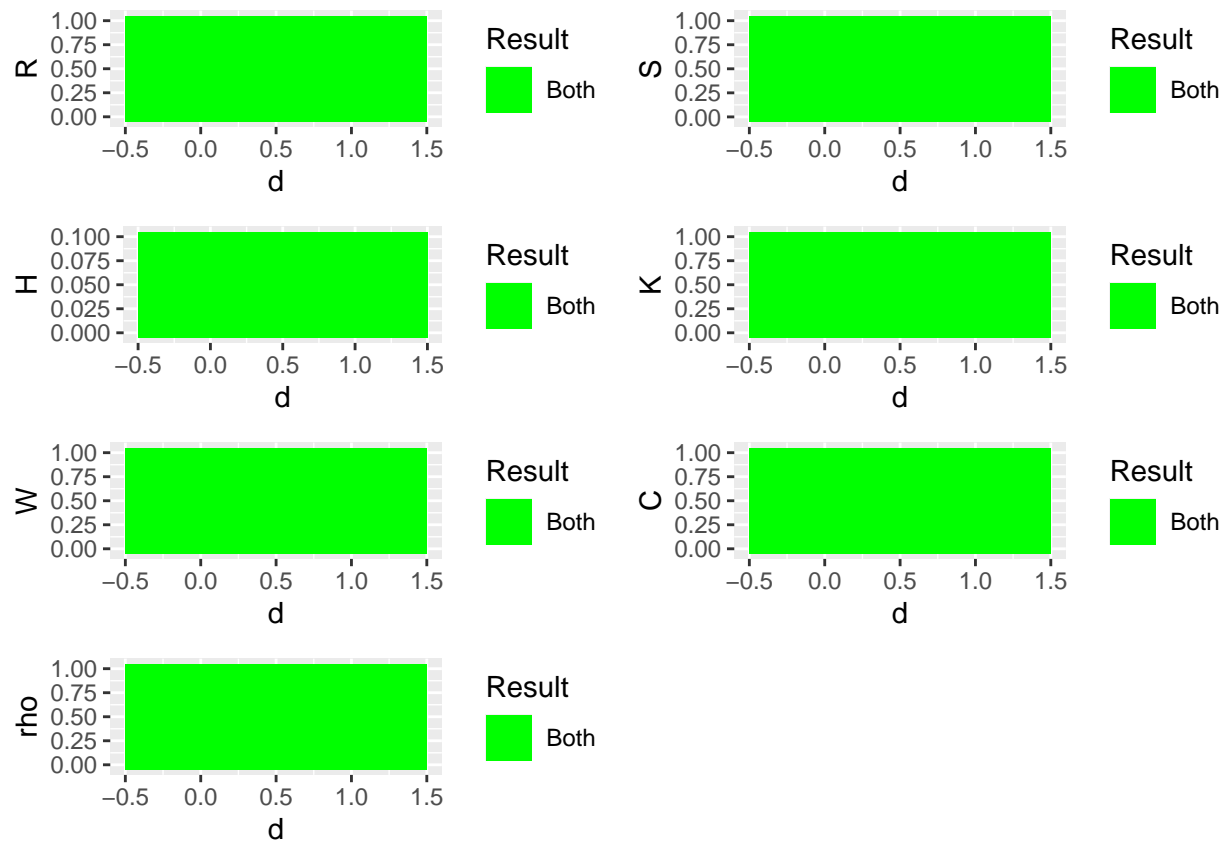Figure 17: w parameter planes

Figure 18: c parameter planes

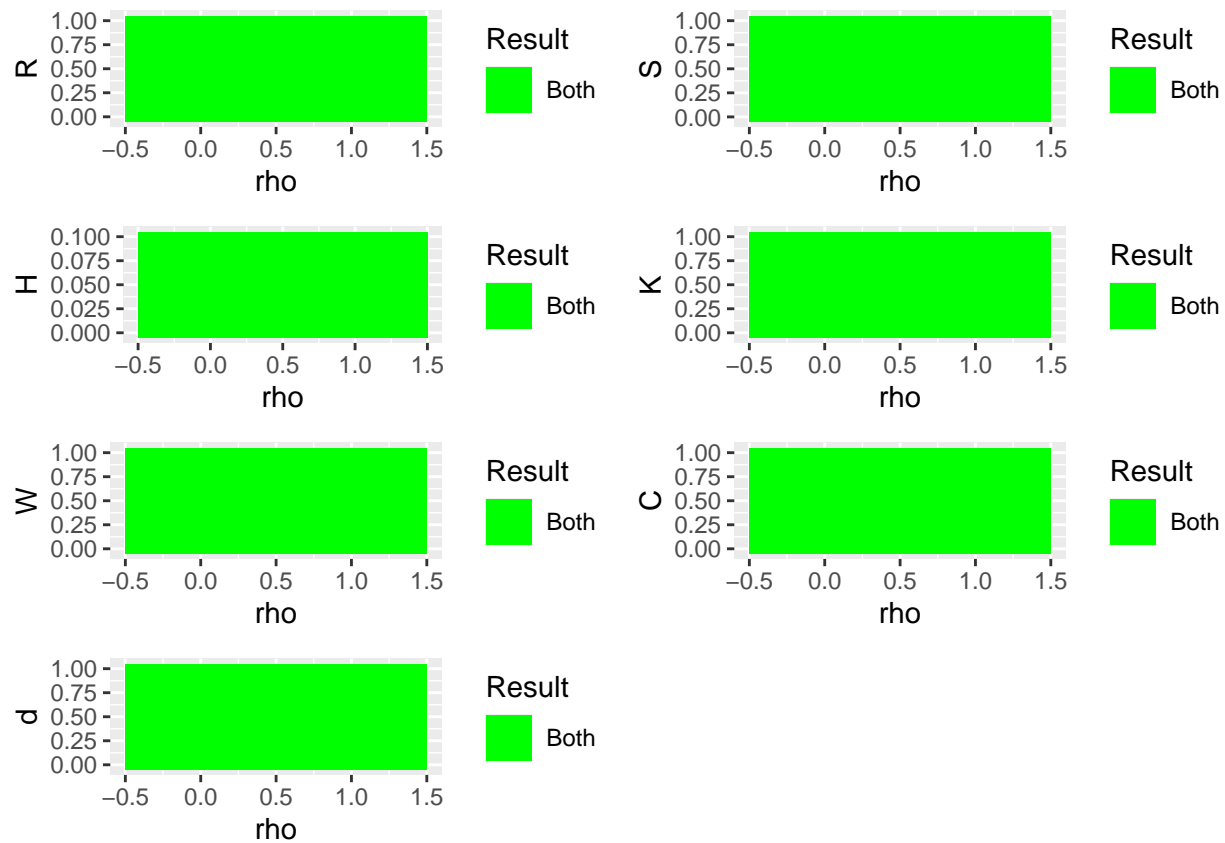Figure 19: d parameter planes

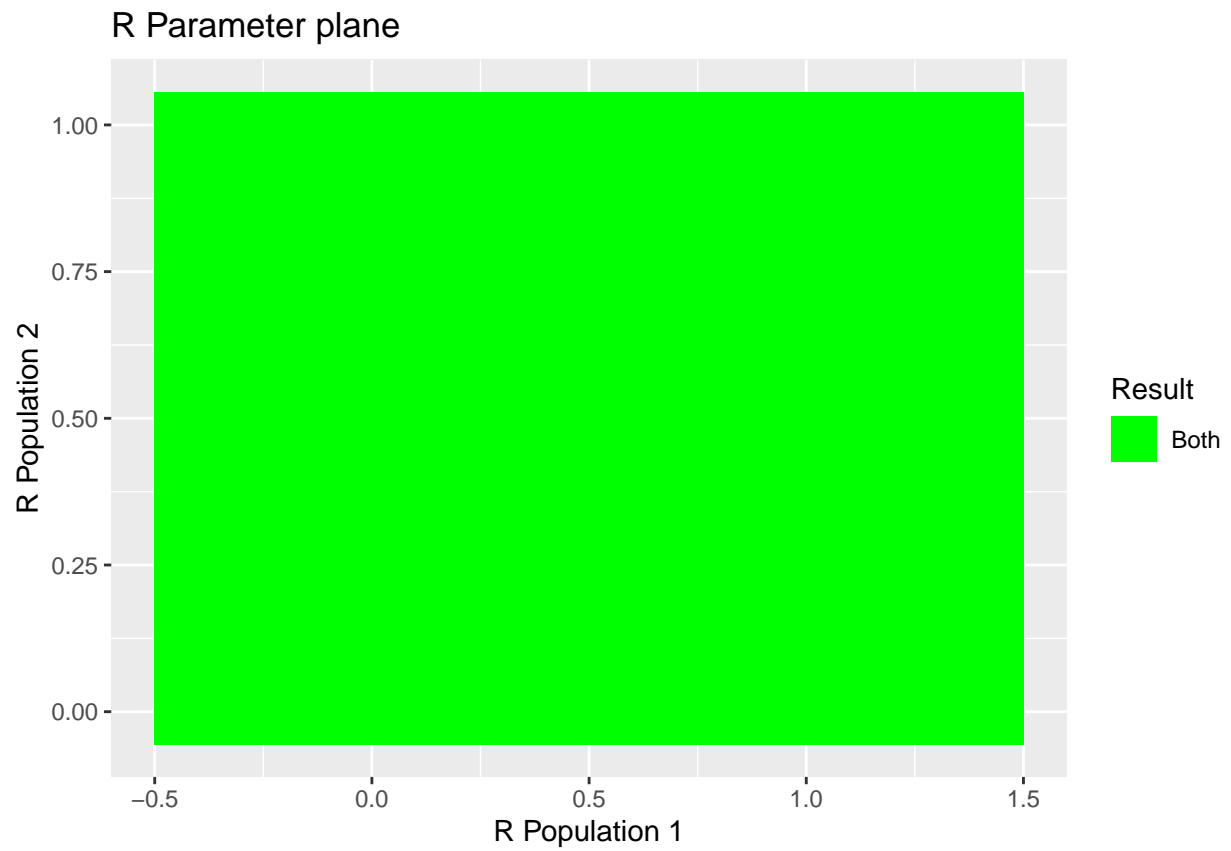Figure 20: roh parameter planes

Figure 21: r population planes

Figure 22: s population planes

Figure 23: h population planes

K Parameter plane

Figure 24: k population planes 0 to 1

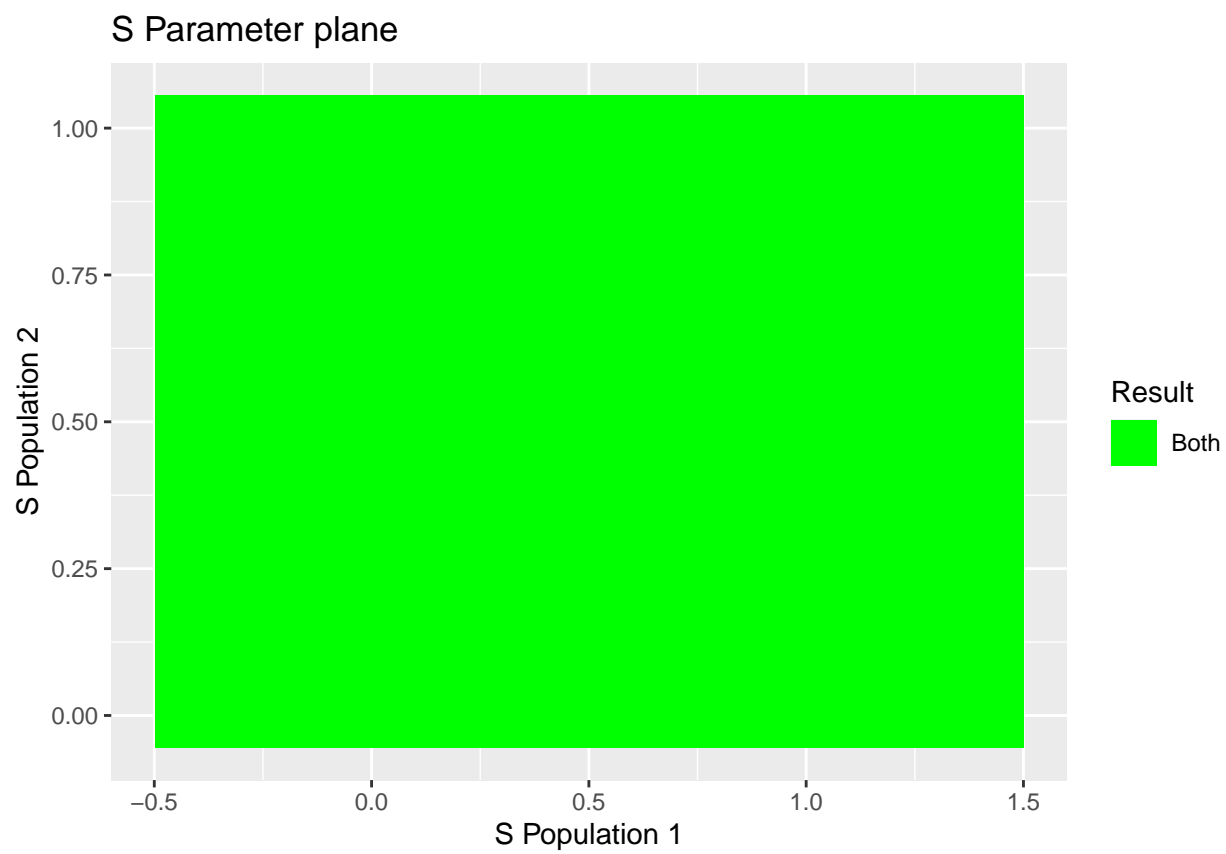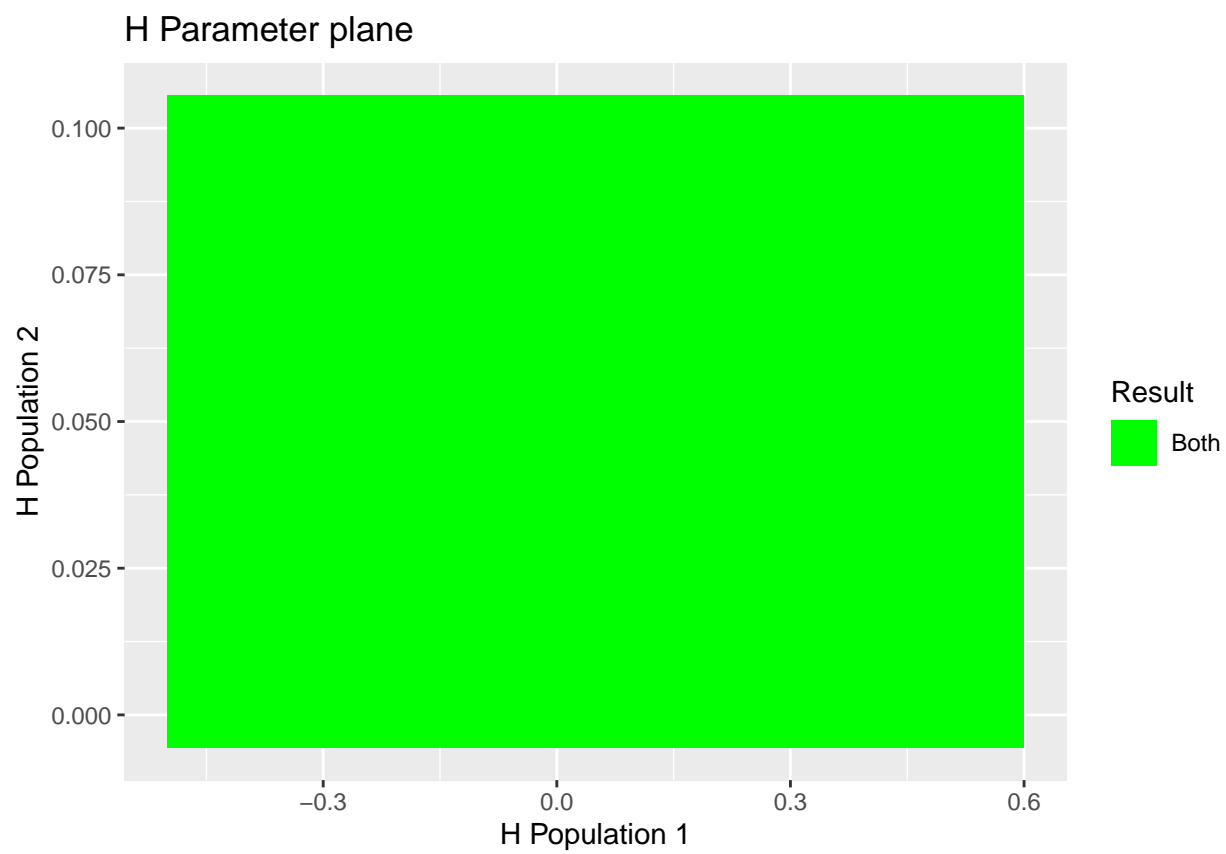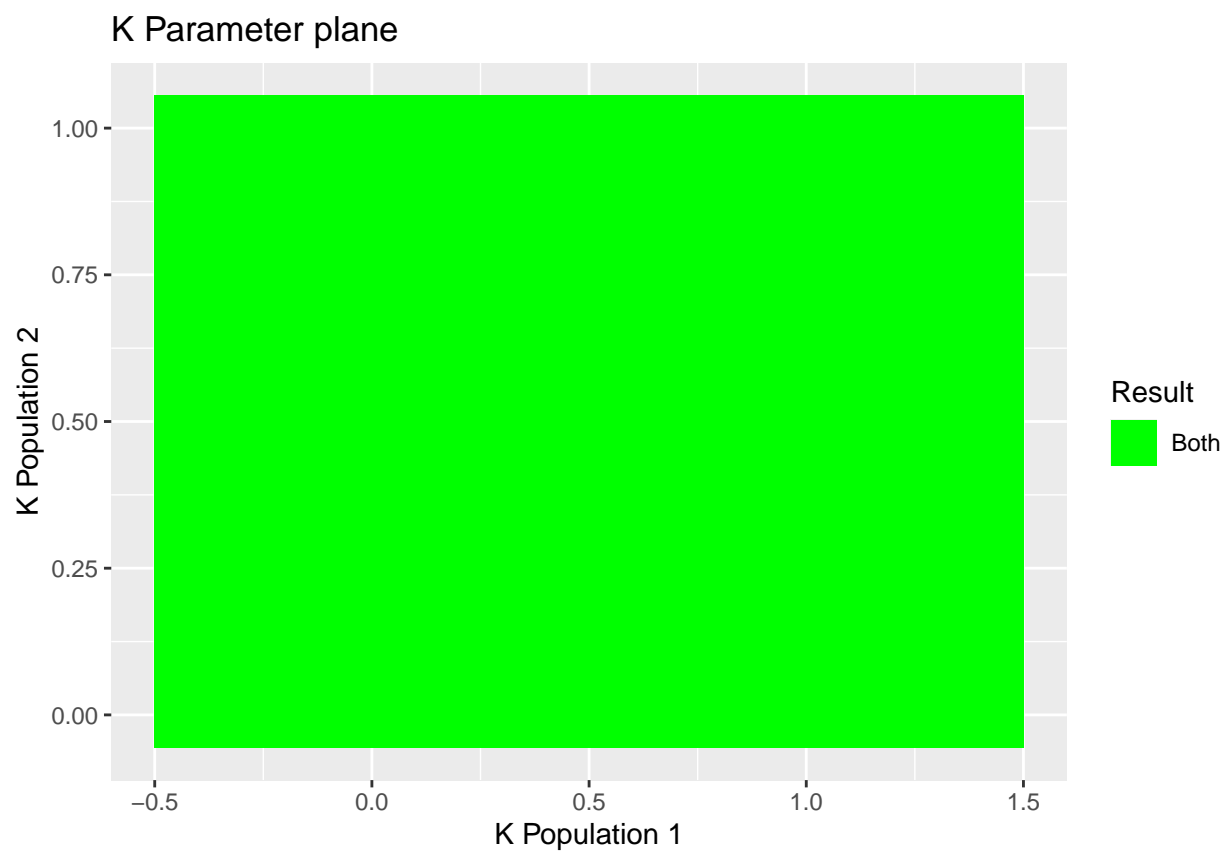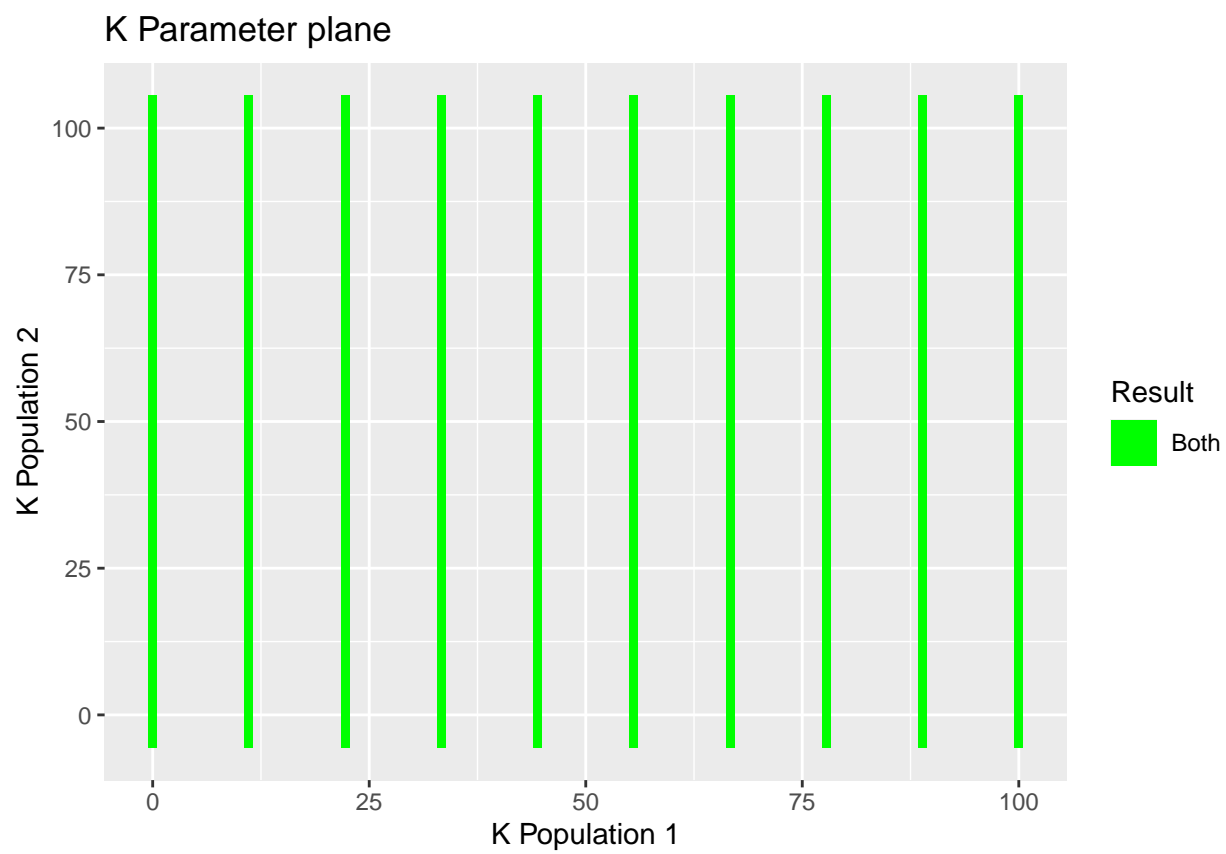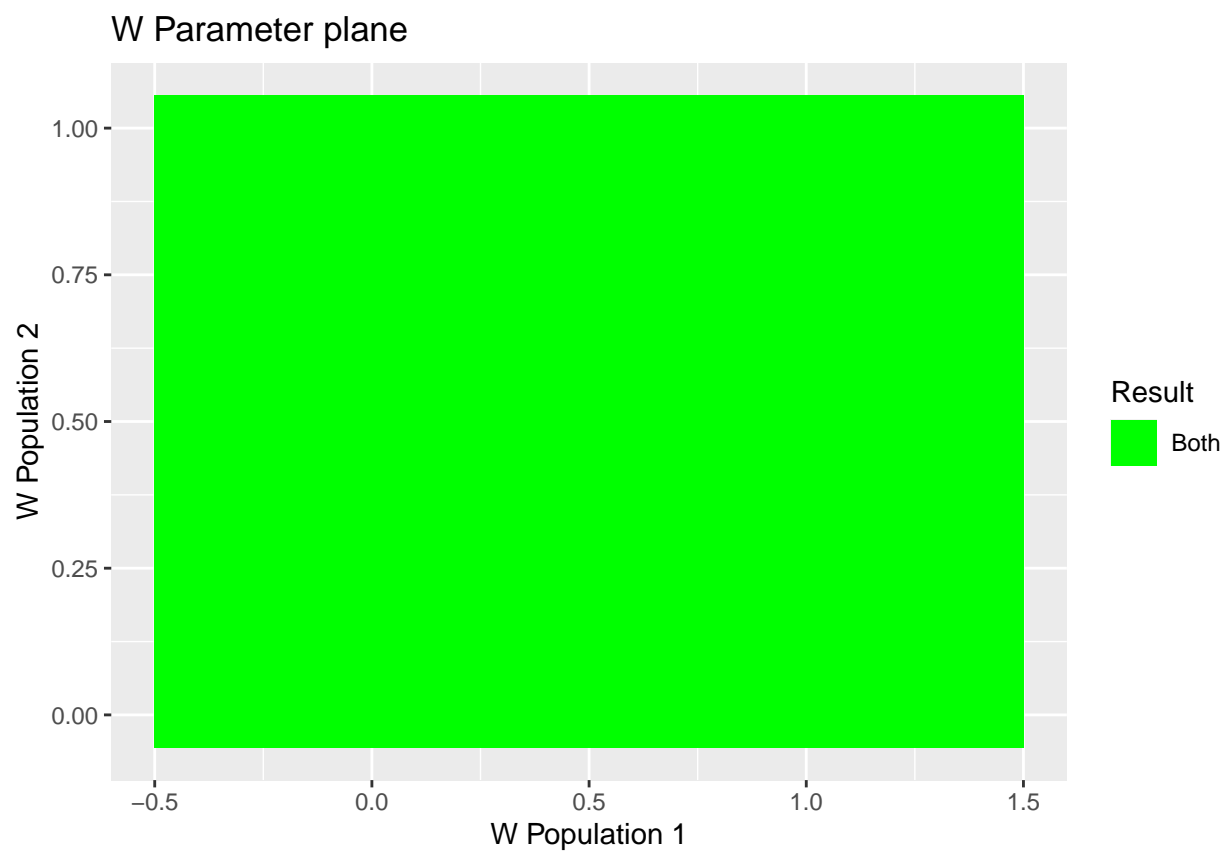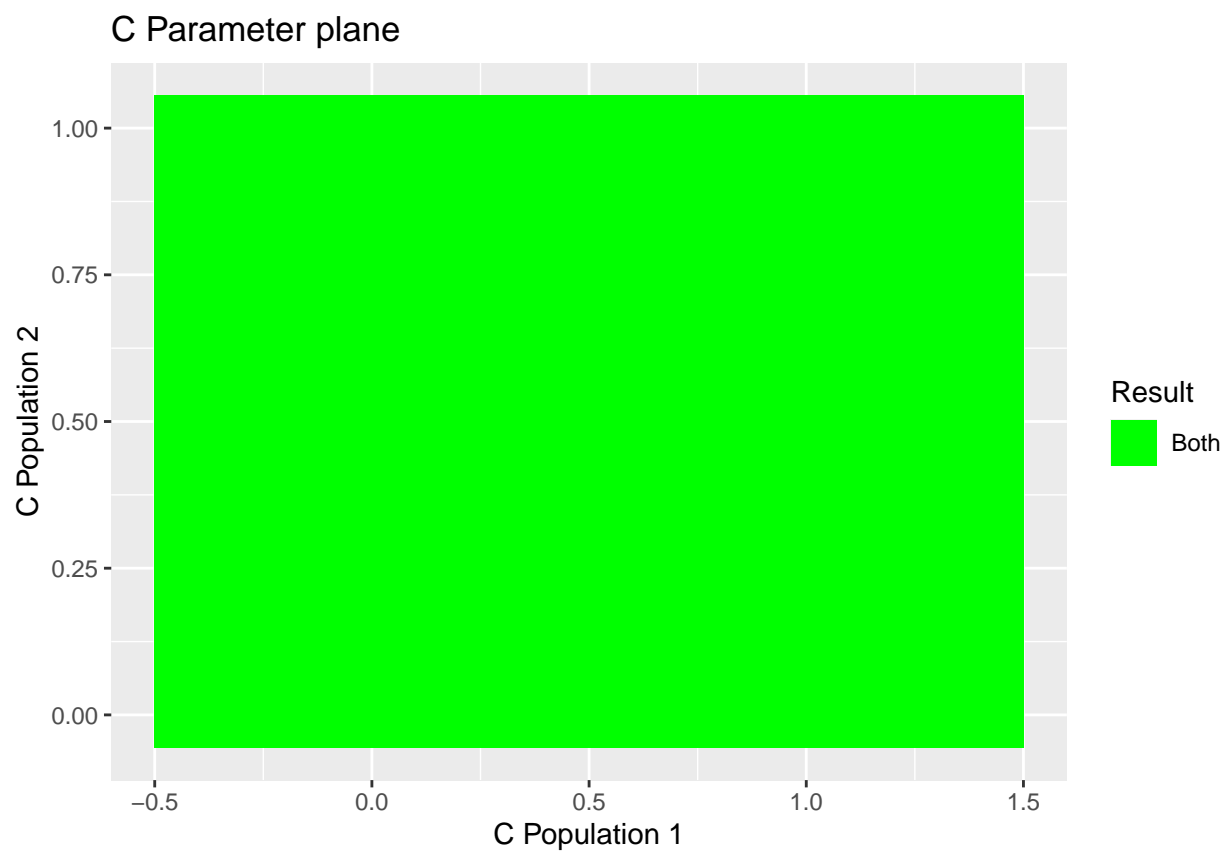Figure 25: k population planes 0 to 100
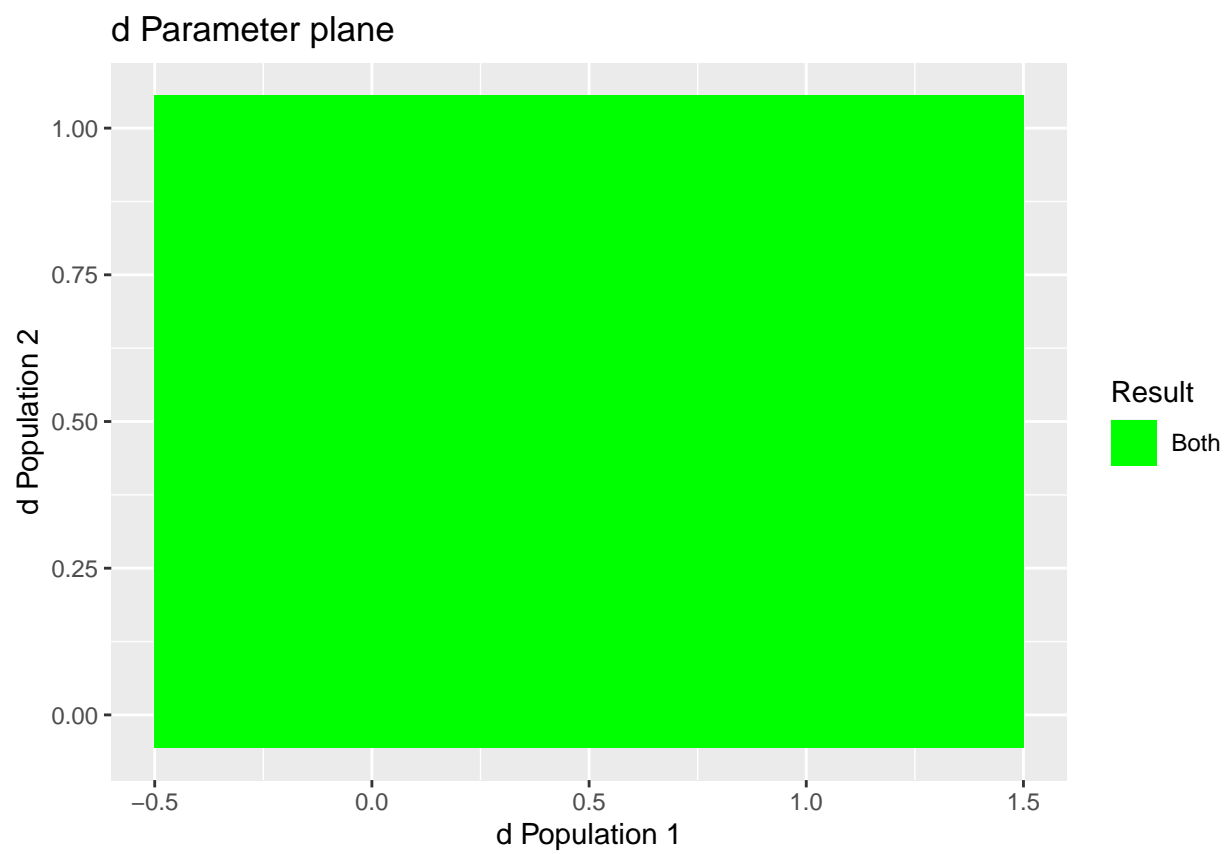
Figure 26: w population planes
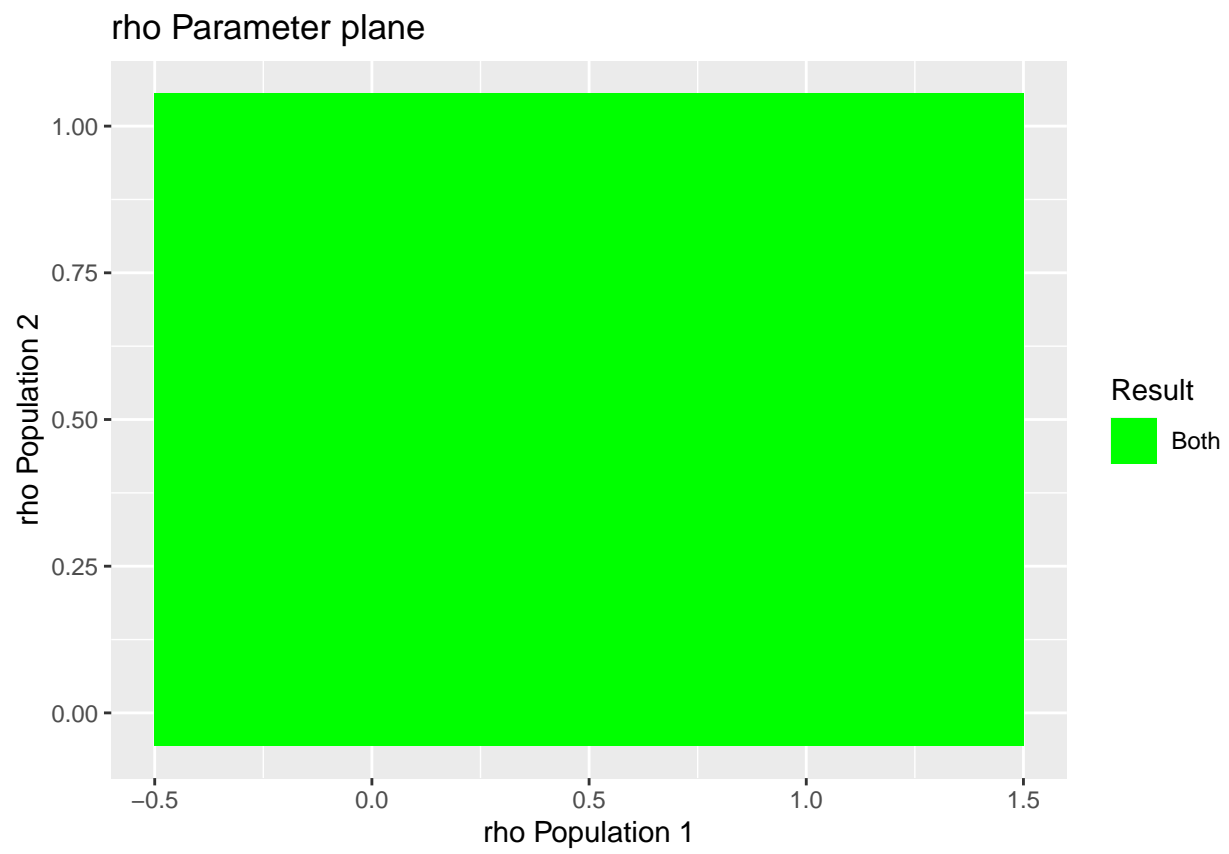
Figure 27: c population planes

Figure 28: d population planes

rho Parameter plane

Figure 29: roh population planes