We are interested in the mechanistic basis for stomatal and plant hydraulic variation that lead to a plant using less water. However this is only useful when the benefits outweigh the consequences – that changing physiology does not lead to stress. As a first step in testing this we have derived a basic physiology explicit crop water use model (schematic to left) that allows us to predict hypotheses about stresses that may occur in field grown plants. After testing these hypotheses in the field we aim to choose traits with the least cost, appropriate for specific environments, and provide breeders with screening facilities.

An example of the costs and benefits of changing stomatal conductance, is that as stomata shut, evaporative cooling also is reduced leading to considerably hotter leaves (see thermal pictures to the right). In turn these hot leaves lead to more transpiration, thus partly reversing the beneficial effect of the stomatal closure.