**Model assumptions**

1. Water availability is the major determinant of vegetation communities structure.

Differences in the utilization of water resources between species was not considered as predictor of the vegetation community structure (i.e. drought tolerance, water use efficiency)

1. Herbaceous plants and woody plants are the superior competitors for shallow water in the intercanopy location
2. All plant functional types have equal ability to access to soil moisture, and all functional types convert soil moisture to biomass with equal efficiency
3. The model does not consider differences between age/size categories of herbaceous and woody plants.
4. Grasses and herbaceous plants with their main root biomass in the upper 20 cm of the soil will not compete with the woody plants for winter rain

**Model Criteria**

-Root system

**Model predictions**

Grasses and herbaceous plants determine how much water is left over for the woody plants.

Tree cover is expected to be greater in areas where there would higher soil moisture content

**Model speculations**

Climate change is expected to increase the aridity of semiarid landscapes by increasing heat stress and decreasing soil moisture 🡪 Extra water can mitigate the negative impacts of climate change? It may benefit woody species since they would be the most affected by climate change

**Facts that support our model**

In 23 studies, resource partitioning (vertical/horizontal) was based on measurements of soil water and plant water potentials, soil water content or stable isotope ratios.

Soil moisture content is most available at shallow depths because of the greater exposure of shallow soils to both precipitation and solar radiation (which increases evaporation).

Horizontal variations in soil moisture are governed largely by the presence or absence of canopies of woody plants. This horizontal variation in soil moisture between canopy vs intercanopy patches can be substantial in semiarid woodlands. Intercanopy areas receive larger precipitation inputs because woody canopies intercept a portion of the precipitation before it reaches the soil.

Even if tree and grass roots overlap to a certain extent, the resource partitioning model can still operate, provided grasses and trees are the superior competitors in their layers, due to different relative distributions at variable depths.

**Other considerations (may be useful to think about)**

Rainfall ranging from 5-15 mm is sufficient for grasses to grow. These small precipitation events only wet the upper centimeters of the soil and therefore usually inaccessible to the shrubs.

Look at Smith and Rethman, 2000 study 🡪 They investigated soil-water partitioning between trees and grasses along a tree-thinning gradient. Along this experimental tree-thinning gradient, grasses and trees competed with each other in the same shallow soil layers because, under natural woodland conditions, the water cannot infiltrate deeply. Thus, the two-layer hypothesis was not applicable.

Deep-rooted trees – hydraulic lift, where water is taken up to the surface form deep roots and passes by osmosis into the surface soil at night, may benefit herbaceous plant and shrubs.

The spatial arrangement of trees influences the amount of shallow water they obtain from intercanopy locations