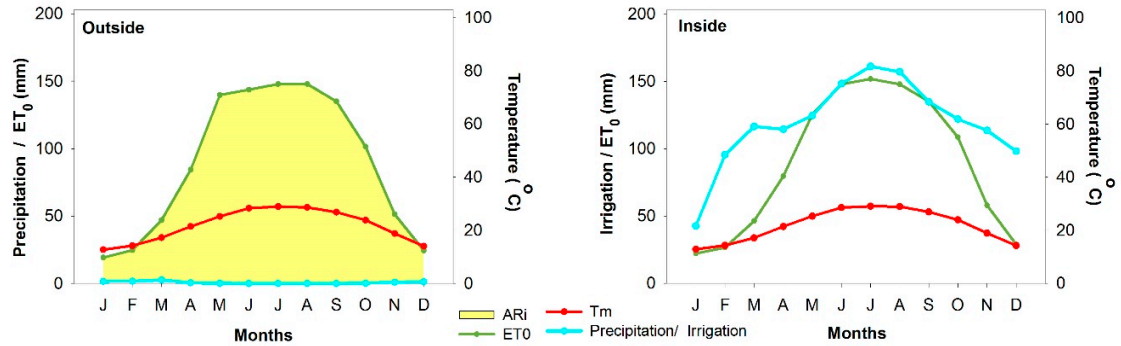
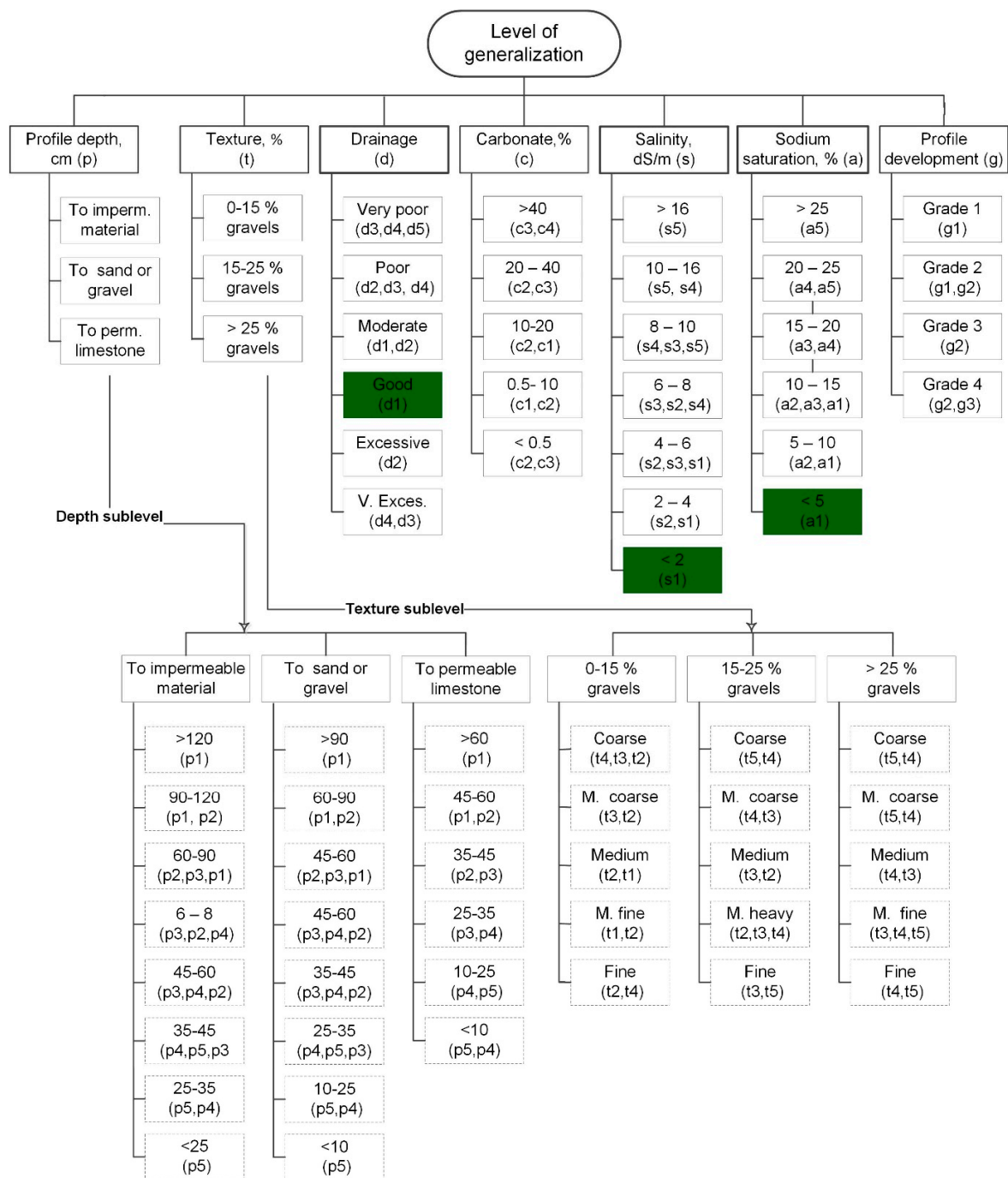


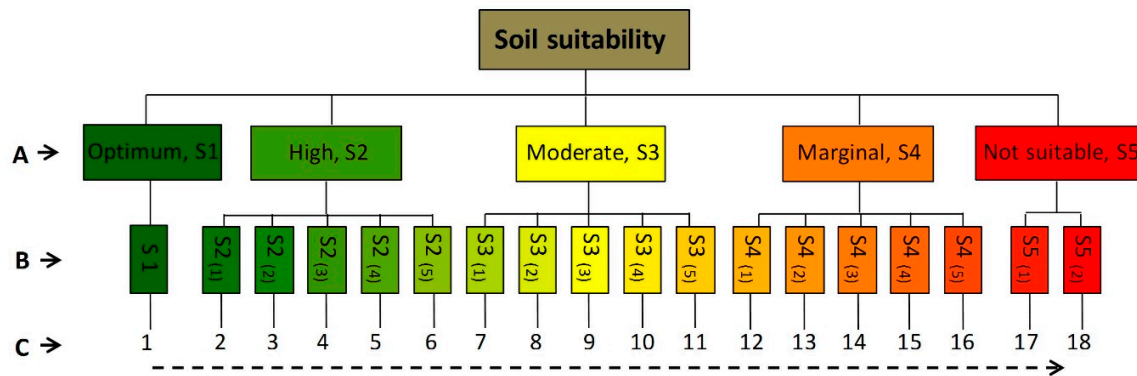
## Supplementary material



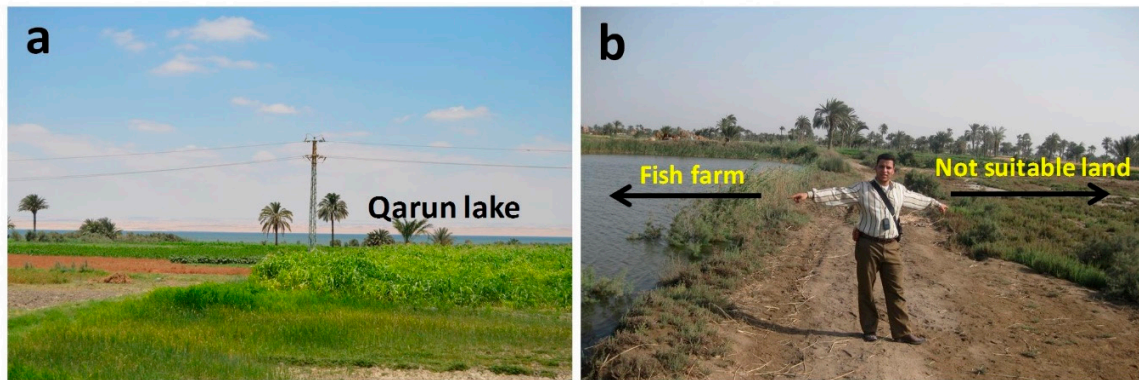
**Fig. S1.** Volumetric climate graphics of El-Fayoum depression weather station and irrigation. Inside (right), include the total amount of water considering both irrigation and precipitation; and outside (left) as no agricultural activities only the precipitation is considered. (T<sub>m</sub>), monthly mean temperature; (ET<sub>0</sub>) potential evapotranspiration; (AR<sub>i</sub>) Aridity index.



**Fig. S2.** Levels of generalization of Almagra model for each soil input factor. The green boxes represent the subclass of the three soil factors that considered in the improvement scenario evaluation.



**Fig. S3.** Soil suitability according to Almagra model outputs. A: suitability classes, B: suitability subclasses with a subscripted number that represents the digit of limiting factors as salinity, sodium saturation, drainage, calcium carbonate content, useful depth, texture, and profile development. C: soil limitation degree.



**Fig. S4.** The adjacent south west of Qarun Lake (a) compared with the southeast part (b).