UNIVERSITÄT HOHENHEIM

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Section: Crop Waterstress Management

Potential of waste water use for jatropha cultivation in arid environments

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Introduction

Agricultural systems are increasingly under pressure from competition for water. Most affected by this are arid and semi-arid regions.

Improved water management should take into account the reuse of **treated sewage effluents (TSE)** for irrigation as an alternative.

However, the use of TSE in agricultural production can lead to the build-up of soil salinity, leaching of nutrients into the ground water. Thus, potential crops need to be salt tolerant, adapted to arid areas, and due to the health risk, ideally, used for non-food products.

Jatropha curcas, claimed to be suitable for growth under adverse conditions, may be an option for biofuel production from plantations irrigated with wastewater.

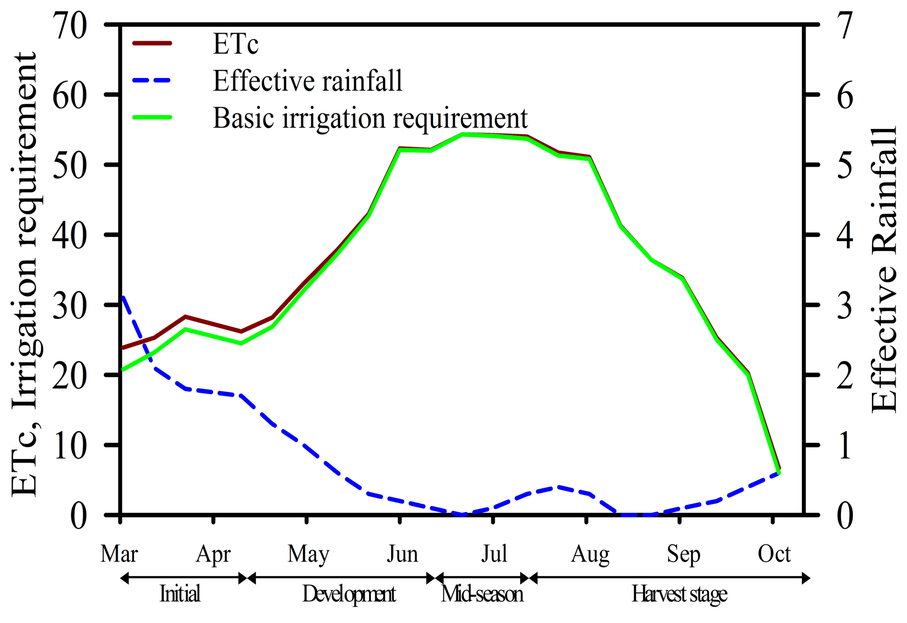
Conclusions and Outlook

- **The size of irrigated surface will depend on leaching fraction (LF).**
- **Soil salinity has to be considered, since jatropha has been reported to be salt sensitive.**
- **N supply from TSE are not sufficient to produce a moderate seed yield, while P and K demand can be satisfied.**
- **The suitability of such an irrigation system depends on environmental factors such as climate, soils and the overall water availability and thus, transferability of the model results presented here needs to be studied further.**

Results

Water requirement

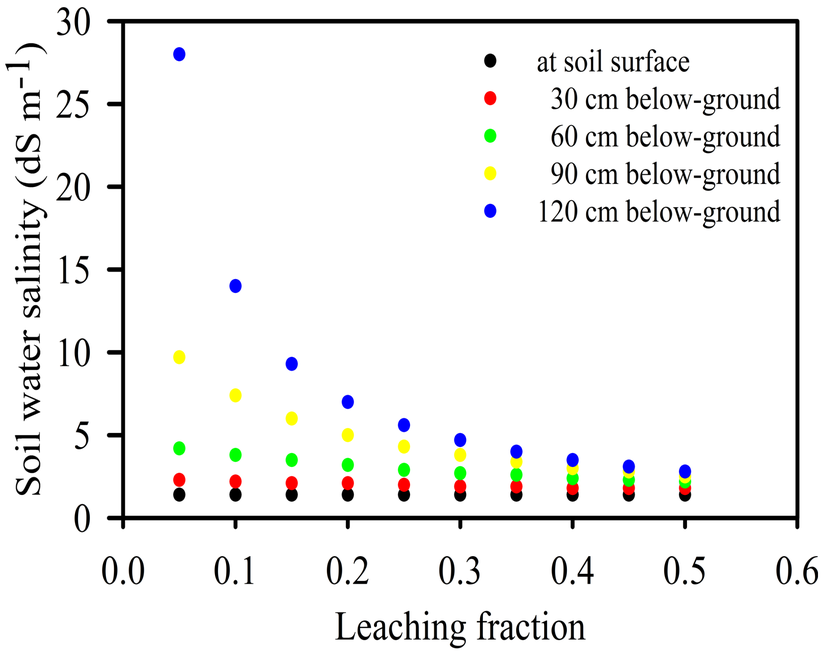
Crop evapotranspiration (ETc), effective rainfall and basic **irrigation requirements (IR)** of jatropha in the reference climate of Tan-Tan during one growing period.



- Total irrigation requirement varied from 779 to 1559 mm per growing season, for LF between 0 and 0.5, respectively.
- Depending on the LF needed to control salinity build-up in the soil, a surface of 73 - 147 ha of jatropha plantation could be theoretically irrigated during one vegetation period.

Soil salinity

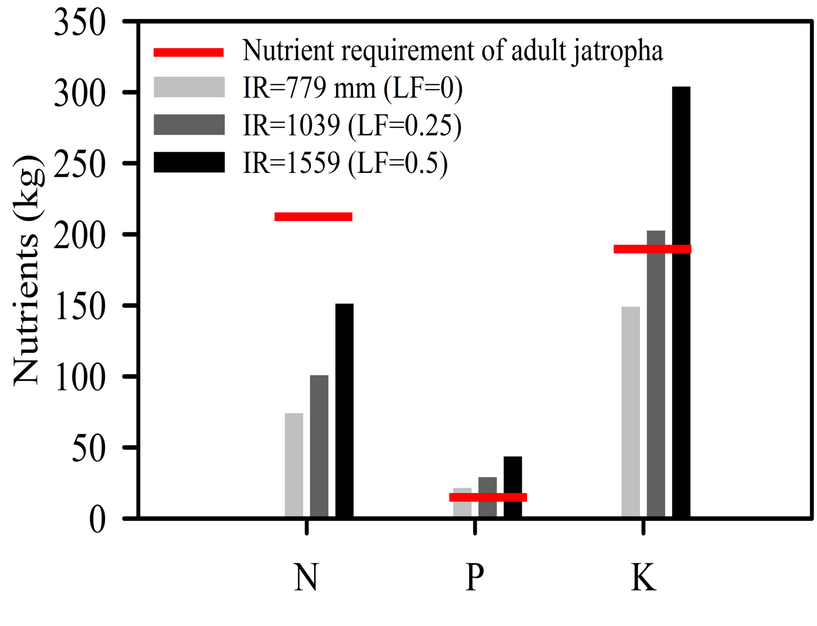
Average soil water salinity resulting from different leaching fractions.



- **Electrical conductivity (EC)** at the soil surface to 60 cm depth, are still suitable for moderately sensitive crops.
- LF between 0.2 and 0.4 would allow maintaining average long-term soil salinity in the root zone for moderately sensitive to moderately tolerant crops.

Nutrient requirement

Comparison of nutrient availability according to the IR and the nutrient demand of adult jatropha with a potential seed yield of 1.52 t ha^{-1}, and a total aboveground biomass of 7.7 t ha^{-1}.



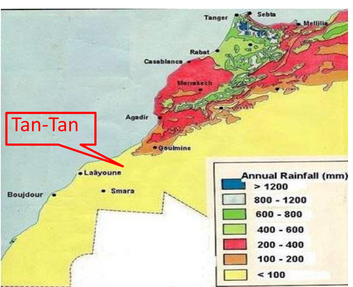
- P supply would be satisfied but not N and K, wth IR = 779 mm (LF = 0).
- There would still be a lack of N with IR = 1559 mm (LF = 0.5).

Kc needs to be validated

Crop salinity tolerance to be validated

Are plants able to take up the entire nutrient load of the effluent?
Fertilizer recommendation for a preciseed yield are needed.

Materials and Methods



- Study site: Tan-Tan province (-11.15°W, 28.45°N, 200 m.a.s.l.), Morocco.
- Average values of TSE from a wastewater treatment plant in Benslimane, Morocco: pH 8.4, EC 1.4

- Parametrisation of the model from literature and own data.
- Over 60 years climate data from CLIMWAT.
- Calculation of water requirement using CROPWAT 8.0

CROPWAT 8.0