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DRAINAGE DESIGN PRACTICES IN IRRIGATED AGRICULTURE; NEW CONCEPTS GAINED FROM RECENT EXPERIENCES IN THREE COUNTRIES OF MAGHREB, NORTH AFRICA

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ABSTRACT Subsurface drainage is a current of irrigated agriculture under arid and semi arid climates. Most of Magherb (Maroc, Tunisia, Algeria) large schemes have been installed in the 70-80's. These three countries are preparing "green plans" meaning plans for agriculture intensification and promotion of irrigation re-engineering for both existing and future schemes. The background of these plans is to reduce to nil the water losses, that implicates to apply less irrigation water than required by crops. In this context what should be the place of drainage: are existing drainage to be rehabilitated and future systems likely to be equipped with tiles ? if yes, according to which design criteria and environmental stakes? here are the basic questions of the paper. In first place the aim of drainage and the current design criteria are reviewed in the three countries. After what we will highlight the issues of the re-ingeneering from an analysis of the current situation the irrigation schemes; for this purpose we will issue monographies of three irrigation schemes, the choice of which being based on a typology. The monographies will report of more than 10 years of north/south cooperation including performance assessment, gray literature, results of on farm experimentation, farmer's practices. The three choosen schemes browse various climatic conditions from Humid Mediterranéan (Gharb, Morocco) to arid (Bas Chelif, Algeria) and Saharian (Fatnassa oasis, Tunisia) and various sizes from 100000 ha, 7 000 ha, 300 ha respectively.

This approach which is not related here leads to the following conclusions :

- the question is to manage salt, not to maintain a watertable at a given depth under obsolete steady state assumptions : the subsurface drainage has to be designed to remove excess of salts
- the schemes installed in defavorable hydrological situations are relevant to drainage in the future

- the current systems, though performing less than at onset, still provide a sufficient and appropriate level of service. Minor re-construction should be operated when design are reported. Soft maintenance is an achievement (manholes, concrete outfalls, singularities of the arterial drainage)
- the former design and practical installation has led to over design. This over design explains the relatively satisfactory current situation, and over design has to be consider for the future schemes as,
- the drainage systems have not been maintained, or marginally
- the new systems should be much shallower than nowadays,
- the leaching fraction should come from precipitations and no more from irrigation.
- in the humid zones, the role of surface drainage is important regarding the yields of winter strategic crops. Surface levelling is mandatory. Subsurface drainage has to be design to remove the water that has not been removed by surface runoff
- in the arid zone, leaching fraction is not likely to be provided every year by rainfall. A rainfall frequency analysis is a pertinent way to assess occurrence of leaching and to determine design criteria.
- in the saharian zone, it is strategic to consider farmers practices to get round salinity since rainfall cannot occur leaching. There is place for subsurface drainage to achieve higher yields but a solution has to be fought regarding root clogging

Keywords: drainage, magrehb, design, salt leaching, performance, sustainability