Land drainage – lands restoration

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Land drainage

- Arid countries
- Semi-arid countries
- Humid countries

Why?

Drainage protects the resource base for food production, sustains and increases yields and rural incomes, protects irrigation investment, increase land value.

The basic objective of agricultural drainage is to provide for a root zone environment that facilitates plant growth and optimizes crop production.

- In arid and semi-arid regions - drainage is linked with irrigation to make it possible to dispose of excess irrigation water and allow for the leaching of soils;

- in temperate regions and the humid tropics drainage facilitates the control of high groundwater and the discharge of heavy rainfall.

- Land drainage - significant impact on the landscape, biodiversity and downstream hydrological processes

- Effective management of river basins in terms of water resources (floods, droughts, recreation and biodiversity) requires the integrated management of both land and water practices.

- In drylands, simple surface water distribution and sophisticated sprinkler and micro-irrigation are used to provide water to crops.

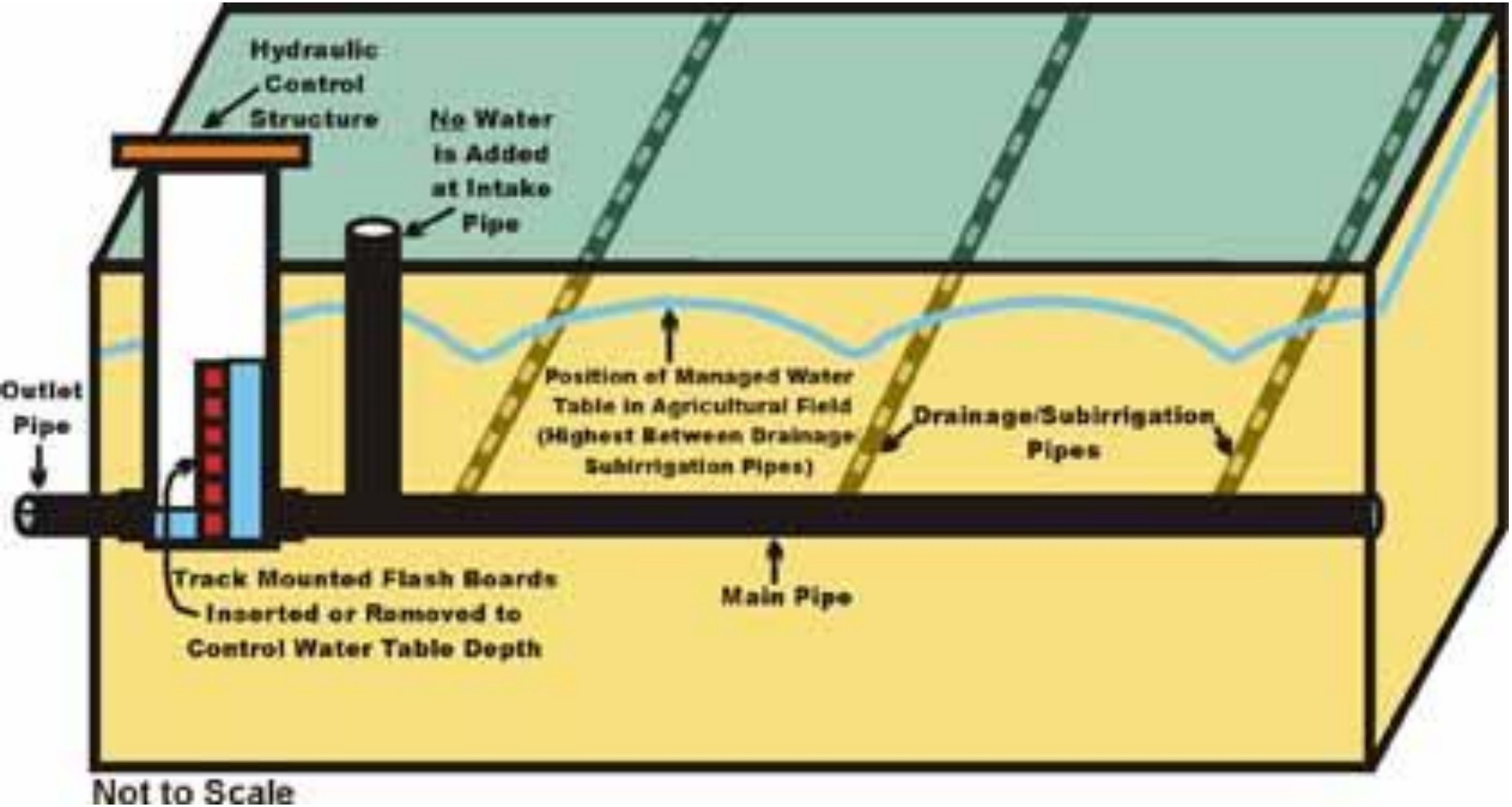
- Some irrigation water is lost as the result of conveyance losses and over-irrigation whether or not applied to limit soil salinity.

- Apart from irrigated areas, salinity poses a major management problem in many unirrigated areas where cropping is done under rainfed conditions.

- Land drainage is needed

- To meet the challenge of a sustainable irrigated agriculture, minimum impact on the environment should be ensured.

- Controlled drainage, a comparatively new approach of drainage management, is suffering from lack of design criteria for both humid and arid regions.


Hydraulic Control Structure
No Water is Added at Intake Pipe
Outlet Pipe
Position of Managed Water Table in Agricultural Field (Highest Between Drainage Subirrigation Pipes)
Drainage/Subirrigation Pipes
Track Mounted Flash Boards Inserted or Removed to Control Water Table Depth
Main Pipe
Not to Scale

- There is a strong need to be developed new design criteria and management methods for controlled drainage system that should have minimum impact on environment.

- Drain installation and maintenance still require a huge investment and skill operators.

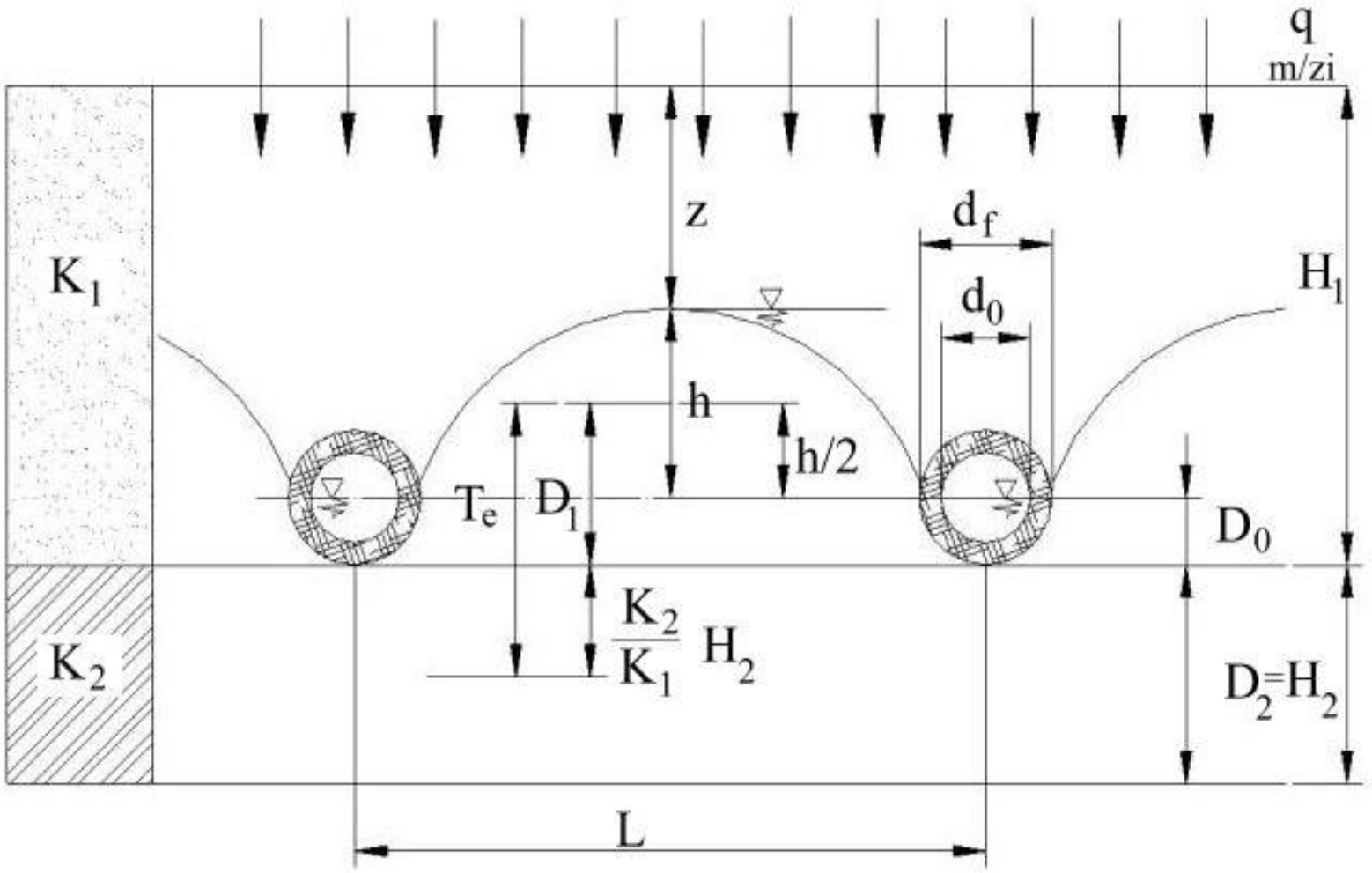
- Low-cost drainage material with robustness should be sought in order to bring the technology to common farmers, who need it.

- Land drainage must be view as an indispensable part of SLM but more researches are needed in this direction especially in defining relevant parameters/ factors and indicators for quantifying the role/ significance in a successful SLM technology.

- My researches were focused on:

- establishing efficient land drainage design techniques for different types of fields;
- adopting foreign land drainage design techniques to Romania;
- studying the possibility of applying controlled drainage in Romania;
- Adopting and implementing different computer tools for land drainage design and operation

Land drainage



$$h = \frac{q \cdot D_v}{K} + \frac{q \cdot L^2}{8 \cdot K \cdot T_e} + \frac{q \cdot L}{K} \cdot \ln \frac{\alpha \cdot D_0}{U} + \frac{q \cdot L}{K} \cdot \zeta_{if}$$

- One assumption used in drainage design is that of an “ideal drain”, without entrance resistance, whereby the drain can be considered as an equipotential.

- Entrance resistance was neglected by many authors because they considered that the drain surround (envelope material and loosened soil in the trench) has a very high hydraulic conductivity compared to undisturbed soil.

- Practical experience has shown that this cannot always be taken for granted.

- For a rational designing of drainage systems is required the completion of the drainage calculation formulas for ideal drains with an additional term which takes into account the head losses from the drain-filter complex

- The entrance resistance is an approach flow resistance and is affected by the physical properties of the disturbed soil around the drain, drain spacing and the drainage materials which are used.

- The entrance resistance can be calculated theoretically from perforation shapes and patterns or by modelling, accurately, the flow pattern towards the drain.

- Nevertheless, the failure to take account of head loss at the water entrance in drains can lead to appreciable errors in drainage hydraulic design.

- In terms of filter material, the most important characteristic, with impact in designing distance between drains, is the thickness of the filtering material and not the initial permeability coefficient or permeability coefficient for filtering material after silting.

- DRAINSPACE (U.K.)
- ESPADREN (Costa Rica)
- EnDrain (Netherland)
- DrenVSubIr (Romania)
- Drenafem (Portugal)
- Sisdrena (Brazil)
- Hidroesta (Costa Rica)
- DrinC
- Integrated Flood Analysis Tool

THANK YOU