

# **A Portable Field Laboratory for Management of Saline Environments and Crop Production**

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Motto: Better Approximately Correct and in Time,  
Than Exactly Wrong and Too Late

## **Abstract**

The professional management of saline agriculture as well as saline environments requires a continuous monitoring of soil and water salinity in order to prevent severe economical losses and to protect natural resources. However, in many cases the salinity monitoring is neglected, as the costs for monitoring activities such as a conventional stationary laboratory and a qualified staff are high and processes of salinization are generally slow. The poster presents an efficient and portable field laboratory that covers the quantitative as well as semi-quantitative measurement of chemical parameters required for the quantitative evaluation of type and degree of soil and water salinisation with respects to crop production and environment.

*Keywords: soil salinity, brackish water irrigation, fertilizer, rapid field test*

## **1. INTRODUCTION**

World wide annually about 10 million hectares of good agricultural land are abandoned due to increasing soil salinity levels, often caused by longterm unprofessional irrigation management, flooding with brackish waters, rise of saline groundwaters or re-use of treated or untreated waste waters (FAO, 1992; Hamdy, A., 1995). In most cases a reliable and efficient monitoring system could contribute to establish a sustainable utilization of salinized soils and waters, prevent economical losses and contribute to the protection of natural resources (Dougherty,

TC, Hall, AW, 1995; Petermann, T., 1996). However, the salinity monitoring is often neglected, even when considered as an important tool for a professional management of plant growth under saline conditions, as the costs for a stationary laboratory and a qualified staff for running it are high.

The objective of the presented field laboratory is to contribute to a professional management of salt affected soils, irrigation with brackish/saline waters for crop production and protection of natural resources from avoidable salinity damages by using efficient field kits and simplified methods, which are salinity specific and easy to learn (Schleiff, 1987).

## **2. MATERIALS**

The box itself is Aluminium made and solide enough to be transported even under difficult conditions. It is the purpose of the following list to give an idea of the equipment and tools offered by the field lab. The components can be combined into the following groups:

### ➤ **Hard-, Plastic- and Paper Ware for:**

- Soil, plant and water sampling
- filtering and volumetric determinations
- bottles, beakers and pipettes
- spatulas, scissors and spoon

### ➤ **Chemicals for Soil Treatment:**

- Salts (Potassium and Calcium Chloride, Sodium Hydroxide)
- Acetic and Sulfuric Acid

➤ **Test Kits for Quantitative and Semiquantitative Direct Measurements:**

- Calcium and Magnesium
- Chloride and Nitrate
- Hydrogencarbonate and pH
- Potassium and Sulfate
- Phosphate

➤ **Electronic Instruments:**

- balance
- pH- and Conductometer

Some important determinations can be executed at two levels of precision, a very rapid one as a first orientation and a more precise one in case of specific importance. The definite composition of the equipment is open and may vary according to local conditions and specific needs and will be adapted by the author after detailed knowledge of the site.

### **3. METHODS**

The demands on the proposed analytical methods are:

- to give reliable data with simplified working procedures
- the data must be converted and interpretable according to internationally accepted standards

The Figure 1 summarizes the main steps of the proposed and experienced working procedure:

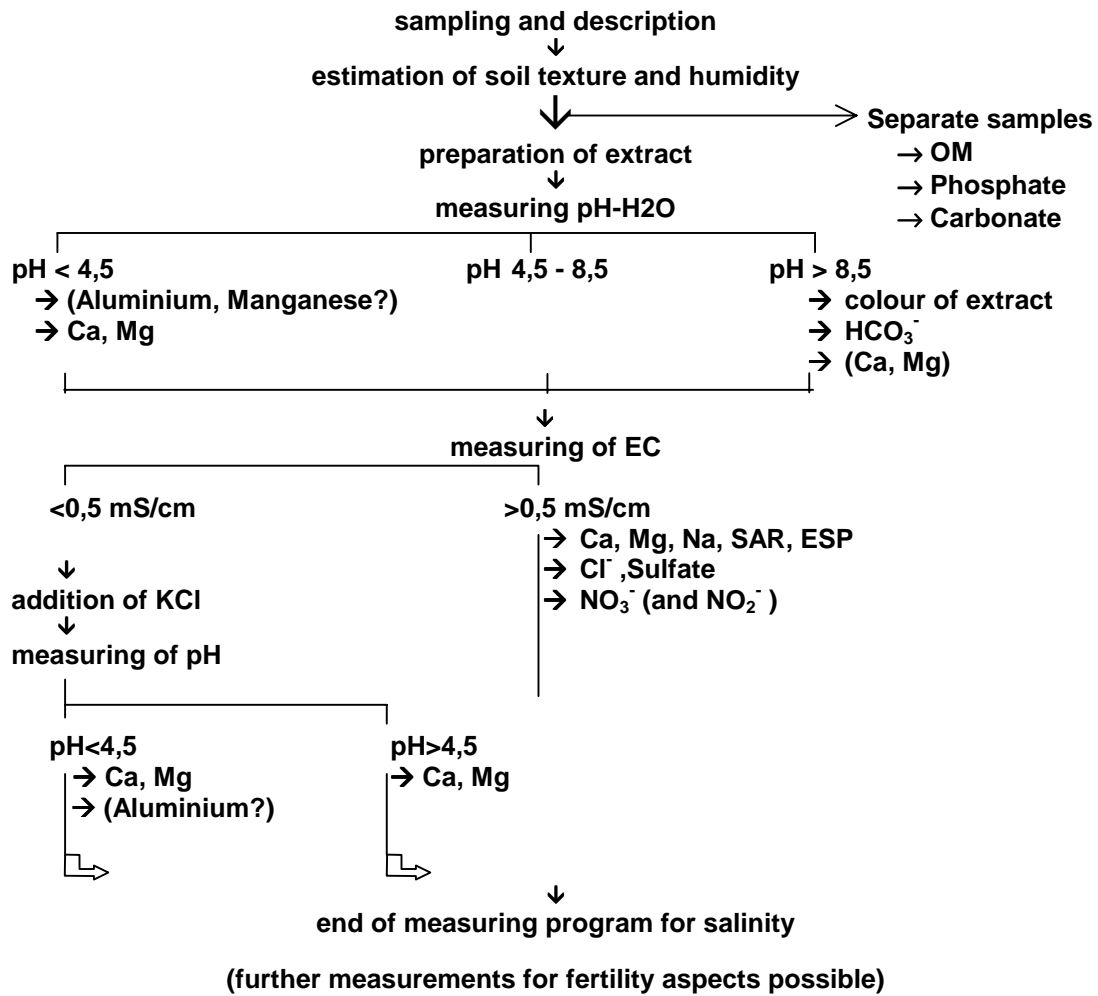


Table 1: Proposed working procedure for analysis of soil samples with the SALINITY AND SOIL FERTILITY KIT (SCHLEIFF, 1987)

#### 4. DATA INTERPRETATION AND RECOMMENDATIONS

The chemical determinations are not considered as an end in itself. All measurements have to serve as basic informations with respect to two major objectives including practical recommendations for:

- a sustainable production of crops under saline conditions
- protection of natural resources (soils from desertification, vegetation, quality of ground- and surface waters)

Thus all results obtained with the simplified methods of the field lab have to be converted into values that can be evaluated according to classical international standards such as e.g.:

- **water quality:** EC, pH, SAR, ESP, RSC, Ca/Mg-ratio, Gypsum forming ions, Nitrate etc.
- **general soil properties:** texture, organic matter, colour, Carbonate
- **soil degradation:** EC of saturation extract, pH, SAR and ESP, Gypsum, CEC etc.
- **nutrient supply of plants:** N, P and K

All measurements are adapted to rating tables which serve as an essential basis for practical recommendations. However we should not forget that the critical values given in rating tables have to be considered very critical them-selves as local conditions may essentially affect them. Thus it is recommended to understand critical values just as a first orientation that has to be checked under local conditions before final practical recommendation are scheduled.

## **5. INTERNATIONAL EXPERIENCE WITH THE FIELD LAB / LIST OF STUDIES**

- Review of recent salinity research activities in BANGLADESH
- Rapid Environmental Impact Assessment of three Minor Irrigation Schemes of Rajasthan/INDIA
- Training course with soils, waters and plants in the Jordan Valley/JORDAN
- Review of the present monitoring activities of SRDI related to the Coastal Salinity of BANGLADESH
- Project appraisal: Protection of natural resources of the Senegal-valley/ MAURITANIA
- Agro-pedological approach for the monitoring of soil + water salinity; valley of the Medjerda/TUNISIA
- Preparation of a desalinisation programme for selected sites around the Lac Oro/MALI
- Rapid evaluation of salinisation progress of soils at the Lac Horo/MALI
- Critical analysis of local fertilizer recommendations with special respect to environmental aspects; ICPP, Improved Crop Production Project in XINJIANG/Peoples Republic of CHINA
- Estimation of ecological and salinity risks in the region of Trarza/Rosso, MAURITANIA
- Study on the evaluation of salinity problems in the irrigation project TINAJONES/PEROU
- Land evaluation for rice production in the plaine of KOULOU/NIGER
- Study on the significance of soil salinity for the crop production on the state farms HUANG HE and LAI YOU WAN in the province SHANDONG/Peoples Republic of CHINA

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