

## SURFACE WATER QUALITY – STATE AND REQUIREMENTS IN AGRICULTURAL AREA

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### ABSTRACT

Intensive agriculture is increasingly contributing to water pollution suffering in return the consequences of it. This complex process is present in the Vojvodina Province, the most important agricultural area of Yugoslavia. This paper deals with the problem of agricultural activities in catchment and their influence to the quality of surface waters. In order to analyse present situation and prevent further deterioration of surface water resources, some representative localities are investigated. The standard classifications (FAO, U.S. Salinity Laboratory) for estimation of water quality for irrigation are applied. The results pointed out close relations between agricultural activities in catchment and surface water quality, which further produce undesirable water quality for irrigation. The recommendation for a minimisation of water pollution from agriculture is given in conclusions.

### 1. INTRODUCTION

It is clear that water is very important for all life being. Water is not disposed in space and time in keeping with users demand. Water shortage is frequently limiting factor in plant production because of its exceptional importance in plant growing processes. Water quality trends around the world, its disposal and use request to treat water as “.... import goods” (1).

Large and rapidly growing human population in dry and semi-arid regions will require considerable increases in food production through expended agriculture. With water as the most important limiting factor for such growth, the world is facing enormous problems in management of scarce resources (2). The resources necessary for food production have shown a marked deterioration during the last two decades. About 16 percent of the world's total cropland is now under irrigation, contributing about one third of total crop production. The irrigated areas yield on average about two and one half times as much per unit area as non-irrigated land. With the limited amount of new areas for cropland available, water must be seen as the major limiting factor for major increases in agricultural production in years to come.

“Further development of the Serbia Republic (where the Vojvodina is one province) depends on agricultural production improvement and could be realized, besides others activities, by irrigation”. (3). This is in accordance with basic orientation from Regional plan of the Serbia Republic, which underlines necessity for sustainable agriculture, health food production, rational resources use, minimizing of environmental degradation and also improving of water and soil quality.

The investigated area is characterised by an intensive agricultural production with wide spread of field crops among which maize and wheat are dominant, and also industrial plants. The average annual consumption of mineral fertilizers is approximately  $680 \text{ kg ha}^{-1}$ , and out of it, nitrogen fertilizers  $130 \text{ kg ha}^{-1}$ . The pig breeding farms of a high capacity, with technology of liquid discharge and without appropriate solutions for wastewater, are potential source of pollution. From the other side, agricultural requirements for good water quality for irrigation is also present at the localities.

## **2. METHODS**

Investigation of water usability for irrigation are carried out on irrigation systems Becej, Irmovo and Titel. Mentioned localities are chosen taking into consideration typical techniques of irrigation, growing plants, geomorphologic units, and soil type. Thirty three parameters in samples of water from surface sources, and in soil samples from characteristic layers are analyzed on all localities. The main aim of this investigation is to select the most suitable classification for irrigation water. The chosen parameters are in accordance with FAO classification for irrigation water quality and US Salinity Laboratory classification. Only part of the investigation results are shown in this paper (4).

## **3. RESULTS**

Global evaluation of water and soil analyzes carried out during growing season on irrigation system Becej, Irmovo, and Titel, could be given as usability estimation by use some of irrigation water classifications. The fact that most of analyzed macro-elements, micro-elements and heavy metals are into permitted limits, directs on possibility to use classifications in which basic mineralisation parameters are included.

Values of EC, TDS and SAR in water from surface sources on investigated systems for irrigation are shown on Figure 1.

According to US Salinity Laboratory classification, water from surface source in Becej can not be used for irrigation, especially during second part of growing season. Similarly can be concluded for system in taking into consideration the first water sample. Usability of water from surface source is better on Titel system, but control of water effect to the soil and plants are necessary.

Global estimation, taking into consideration evaluated surface water usability for irrigation according mentioned classification, is that water on analyzed irrigation systems can not be used because of its inappropriate effects to soil salinity.

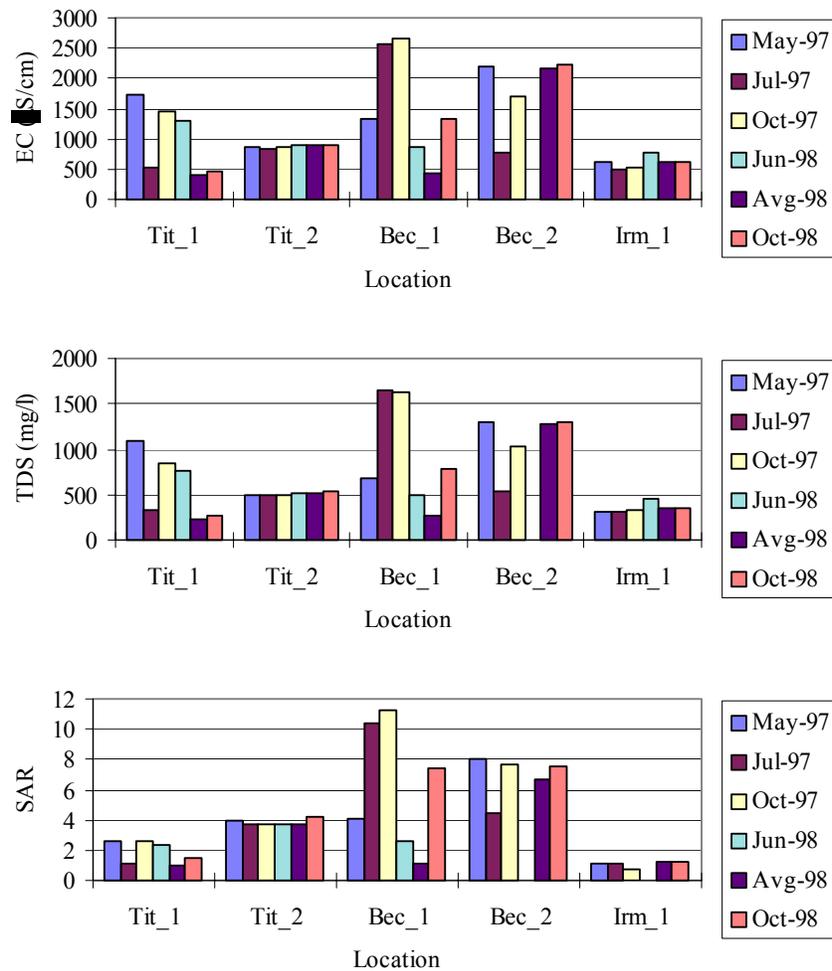


Fig. 1. Values of EC, TDS and SAR in water from surface sources and on investigated systems for irrigation

#### 4. CONCLUSION

The results of numerous investigations of water sources for the purpose of irrigation have indicated that the existing classification of waters may be successfully employed.

It should be pointed out that the FAO classification, intended for a global international use, has been created to cover all the climatic and geographic regions, with a vast diversity in the existing natural conditions. However, the regional or national classifications (although having a common basis as a starting point, e.g. salinity degree) have their pragmatic intentions, to fit the criteria to the existing edaphic and non-edaphic factors of the environment.

A comparative study of the application of different methods for classification of irrigation water indicates a significant congruence of the procedures used to analyze water suitability. The contemporary and recommended classifications give a similar evaluation of the effect of water on the salt regime in the soil. Besides, the criteria have been amended by taking into account the interactions occurring in the water-soil-crop system.

Complex measures for minimisation of water pollution imply a series of synchronized activities, of which the following are the most important (5):

- Determining the catchment area.
- Adjusting production plans to an appropriate crop rotation. A five-crop- rotation (wheat, corn, sugar beet, sunflower, soybean ) is recommended for biological reasons, as well as for mineral fertilization and its balanced influence on potential pollution.
- A study of all transport processes of pollutants in the ecosystem.
- A strict control of a preventive production technology, implying a correct use of agricultural machines for soil cultivation in order to reduce the pulverization of the surface soil layer and increase its resistance to wind erosion.
- A planned establishment of wind breakers in the region exposed to wind erosion.
- A rational and restricted use of mineral fertilizers paying particular attention to the kind of fertilizers used, their application rate, the time and the method of their use. Total doses of basic and nitrogen fertilizers needed for different soil types in a catchment area should be determined on the basis of a soil fertility survey.
- An optimised use of pesticides, specifying restrictions on dose, time and method of application.
- A constant monitoring of the catchment area, enabling to control the risk of accidental pollution.

## 5. REFERENCES

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