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# Irrigation in Bulgaria focusing on water savings attempts and achievements

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## Abstract

Well known fact is that irrigation, being a prerequisite for a sustainable population growth and cultural development, has been practiced by humans since ancient times. Considering the present enlarged population on earth and on-going processes of climate change and uncertainties, the importance of irrigation is supposed to increase substantially, while available water for irrigation is expected to get scarce (Alexandrov (Ed.) 2011; Slavov et al, 2013; Moteva et al,2015).

**The objective** of present report is to share a feedback on quantitative water savings and environment protection achieved in Bulgaria, using results of *experimental trials* and *validated simulation tools application at point & field scale*. The performance is related to improved furrow irrigation technologies by monitoring water application uniformity and efficiency under Traditional Continuous and Surge Flows.

Surface irrigation has been a dominated practice worldwide, even when the remaining technologies, as sprinkler and drip irrigation, have a significant role for our society (Varlev, 2011). Due to the dominated **soils of large water holding capacity** and **appropriate terrain slopes of 0.3 to 3%**, furrow irrigation is exceptionally favourable for application under Bulgarian conditions. Thus, it used to be practiced over **6-7 million decare** in this country while being a subject of detailed scientific studies during the period **1970-1991**. As a result, water distribution uniformity&application efficiency, soil erosion and nitrogen leaching to ground water have been studied in several regions. Consequently, original water-saving and environment-friendly improved technologies for furrow irrigation and fertilization, as "surge" irrigation, "alternative furrow" irrigation with fertilization in "dry furrows" and others, have been developed, investigated and applied in irrigation practice.

During the years of transition from "a state planned" to "a free market" economy, due to the deep crisis in agriculture and consequent loss of traditional relationship between science and practice, considerable part of gained knowledge, experience and potential could not find a real practical application. In the context of water saving agriculture, the aim of present study is to report on:

- a) Actual state of irrigation in Bulgaria;
- b) The point of traditional and surge furrow irrigation - sharing feedback on quantitative irrigation water saving achieved through changing of the irrigation system;

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c) Contemporary methods of improved irrigation management by limiting water & soil losses due to surface runoff, drainage and nitrogen leaching through application of the concepts:

Economically optimal uniformity in irrigation application when total sum of all costs and losses due to Nonuniformity of irrigation is minimal;

Water saving technologies application, as: surge irrigation; multi-set furrow irrigation; cutback irrigation aiming at decrease&elimination of runoff; alternative furrow irrigation that improves lateral water distribution uniformity&avoids soil erosion; surges of diminishing on-time from 30 to 3 min during "run-off" stage at the lowest furrow set.

Scenario analyses through model simulations aiming at optimization of water balance, irrigation scheduling and crop yield, considering the so called "global" nonuniformity of irrigation and climate variability and change.

**Keywords:** climate change, furrow irrigation efficiency, irrigation non, uniformity, water saving methodologies, model simulations, EU water regulations.