Sustainable water supply and soil system for food production in the context of climate change in Bosnia and Herzegovina

M. Balaban, R. Cupac** G. Trbić*, S. Pržulj*, M. Ivanišević*, S. Gnjato*, D. Savić*

** Faculty of Natural Sciences and Mathematics, University of Banja Luka, Mladena Stojanovića 2, Banja Luka, 78000, Bosnia and Herzegovina (E-mail: milica.balaban@pmf.unibl.org)*

*** UNDP Bosnia and Herzegovina, Sarajevo, 71000, Bosnia and Herzegovina*

Introduction

Direct agricultural production in the field is estimated to contribute approximately 15% to total greenhouse gas emissions. Also, related production and other economic activities including the production of fertilizers, pesticides, cultivation, irrigation and fertilization processes, as well as transport, packaging and storage of food, lead to the emission of an additional 15-17% of the total amount. On the other hand, changing climatic conditions caused by such volumes of emissions negatively affect the productivity of food production, nullifying the effects of increasing yields by applying advanced agricultural methods

Strengthening local food systems is presented as one of the most important steps forward in ensuring sustainable production during this century in securing the global transformational potential of food rights.

The aim of this research is to contribute to the model development of a sustainable and safe irrigation system on agricultural land plots of local food producer as a contribution to the establishment of profitable and sustainable production of healthy vegetables for the production of food and spices.

Results & Discussion

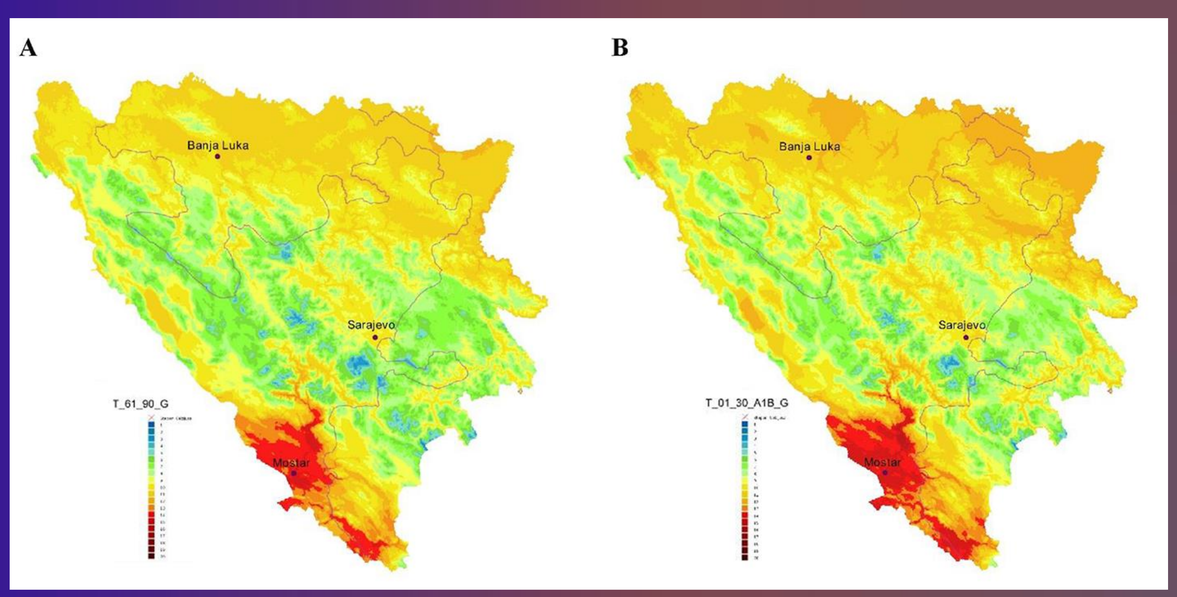

Figure: Average annual temperatures in Bosnia and Herzegovina, period 1961-1990 (A) and projected average annual temperatures in Bosnia and Herzegovina, period 2001-2030 (B)

This research model has been also extended by the simultaneous monitoring of several chemical parameters of agricultural soil and irrigation water to assess possible migration routes, in order to develop reliable rapid methods for assessing the chemical safety and security of the entire system.

Figure: Sampling, sample preparation and extraction of specific biomarkers of the presence of pollutants on the tested soils

In the observed area, an increase in temperatures has already been observed at the annual level, but also in all seasons (Bajic and Trbic, 2016). Also, there is an evident trend of increasing temperatures during the vegetation period, but an increase in days without precipitation (Trbic *et al*, 2017; Popov *et al*, 2019). Such generalized climate changes already require irrigation of agricultural areas, because the amount of precipitation excreted is not sufficient for optimal growth of agricultural crops.

Climate models and climate scenarios point to increases in the number of rain-free days in the near future. The paper will present the expected estimates of precipitation during the vegetation period according to the climate scenarios RCP4.5 and RCP8.5.

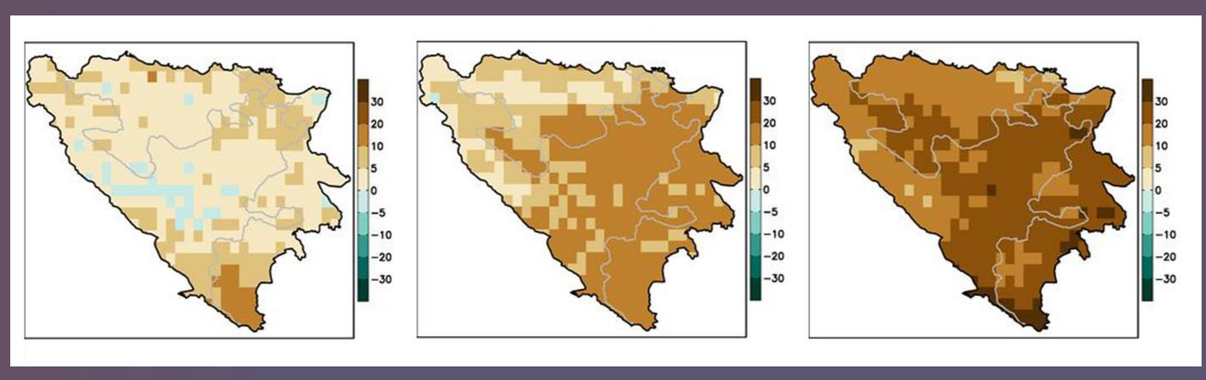

Figure: Changes in the number of dry days (days without precipitation) by the end of the 21st century for the territory of Bosnia and Herzegovina, according to the climate scenario RCP8.5

The yields of the most represented fruit crops in Bosnia and Herzegovina largely depend on climatic conditions, especially drought and water availability. High temperatures and long summer days with reduced precipitation will cause great risk and pressure in the fruit production sector in B&H. The biggest change, i.e., increase, in the number of summer days is in the northern and southern part of the territory.

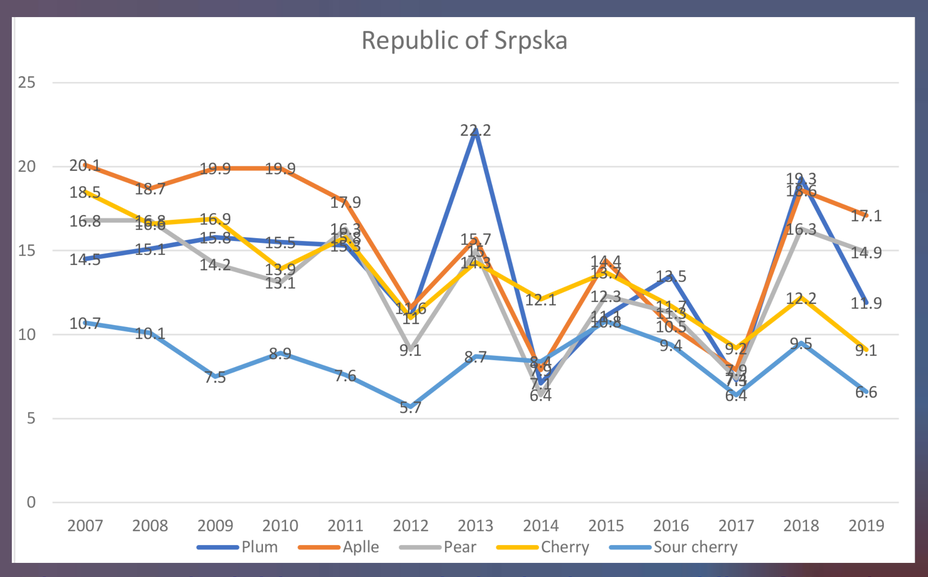

Figure: Fruit yields per tree in kg in the Republic of Srpska for the period (2007-2019).

Conclusions

Planned and intensive agricultural production in Bosnia and Herzegovina requires more and more intensive use of agricultural resources that would prevent the side effects of climate change. Increasing agricultural production in Bosnia and Herzegovina will require greater provision of water for irrigation. The largest share of agricultural land is in the north of Bosnia and Herzegovina, in the territory where there is enough water available for irrigation.

This work was supported by the Ministry of Scientific and Technological Development, Higher Education and Information Society of the Republic of Srpska, “Synergy” Grant (19.030/961-20-1/21): *A multidisciplinary approach to support the expansion of the raw material base of a domestic food producer*