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- PROCEEDINGS -

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SUSTAINABLE MANAGEMENT OF AGRICULTURAL RESOURCES IN MAIZE PRODUCTION IN BIH - H2020 SMARTWATER PROJECT

*Mihajlo Marković¹, Đurađ Hajder¹, Milan Šipka¹, Mladen Todorović²,
Nery Zapata³, Teresa A. Paço⁴, Erminio E. Riezzo⁵, Sabrija Čadro⁶*

Abstract: The increased need for smart management of agricultural resources resulted in the preparation and implementation of H2020 project SMARTWATER. This publication aims to present the main outcomes of SMARTWATER in three years of implementation (2021-2023), to encourage relevant target groups to participate in the action in 2024 and to promote smart management of agricultural resources. During project implementation different results were obtained. SMARTWATER team will continue with different twinning activities in 2024 aiming to promote smart agriculture practices, increase the competencies of scientists and young researchers and disseminate the project outcomes.

Keywords: field crops, irrigation, young researchers, sustainability, water

Introduction

In previous research, Bosnia and Herzegovina was characterized as a country with a good irrigation potential but relied on rainfed agriculture practices, which impose a need for smart management of land and water resources (World Bank, 2012; FAO, 2017). These and similar findings resulted in the preparation of a proposal and implementation of a new H2020 project titled SMARTWATER². A project was launched on the 1st of January 2021. Main project topics include: 1) cloud-based smart technologies, 2) new generation of satellite remote sensing data, 3) water-energy-food nexus and 4) climate change impact on agriculture. Publications regarding these topics were prepared and published by SMARTWATER team during the implementation in scientific Journals and Conference Proceedings (Zenodo, 2024).

¹ University of Banja Luka, Faculty of Agriculture, Bulevar v. Petra Bojovića 1A, Banja Luka, Bosnia and Herzegovina (mihajlo.markovic@agro.unibl.org); ² Centro Internazionale di Altistudi Agronomici Mediterranei, Via Ceglie 9, Valenzano, Italy. ³ Agencia Estatal Consejo Superior de Investigaciones Cientificas, Calle Serrano 117, Madrid, Spain; ⁴ Universidade de Lisboa, Instituto Superior de Agronomia, LEAF, TERRA, Tapada da Ajuda 1349-017, Lisbon, Portugal; ⁵ SYSMAN PROGETTI & SERVIZI SRL, Via G. Lorenzoni 19, Roma, Italy; ⁶ University of Sarajevo, Faculty of Agriculture and Food Science, Zmaja od Bosne 8, Sarajevo, Bosnia and Hercegovina;

² <http://www.smartwater-project.eu/>

Within WP3, joint experimental studies are being conducted at two locations in BiH, with maize as the main crop and different irrigation and fertilization amounts as the main factor modalities. Irrigation and fertilization treatments in maize were investigated in some previous research (Kresović et al., 2016; Stričević et al., 2017; Dodig et al., 2021).

The main objective of SMARTWATER is to reinforce new networking, research and S&T cooperation capacities of the University of Banja Luka (UNI-BL), the University of Sarajevo (UNSA) and other connected national institutions, in the field of sustainable agricultural water management and to increase their competency and fund-raising skills for a successful participation in the European Union Research Programs³.

The project's initial duration was 36 months but now it has been extended to 42 months (until June 2024). SMARTWATER consortium consists of six partners: UNI-BL, CIHEAM-IAMB, CSIC, ISA, SYS and UNSA⁴ and implementation has been done through five Work Packages (WPs).

This publication aims to present the main outcomes of SMARTWATER project in three years of implementation (2021-2023), to encourage all relevant target groups to participate in the action in 2024 and to promote smart management of agricultural resources in Bosnia and Herzegovina and abroad.

Project implementation in 2021 - brief overview

The kick-off meeting was held in a hybrid form on the 27th of January 2021 and gathered all partners. Communication channels were established (official website and social media profiles on *Facebook*, *Twitter*, *LinkedIn* and *YouTube*). The UNI-BL team participated in the REA Cluster Event⁵ (20.5.) and in the symposium *AgroReS 2021*⁶ (27-28.5.). The 1st stakeholders' meeting was organized by UNSA (7.6.).

The 1st summer school "*Integrated approach for agricultural water management*" was organized in Trebinje (30.8.–3.9.). SMARTWATER project was presented in an interview with INTRASOFT International⁷.

³ European Commission (2020). Grant Agreement, project number 952396, SMARTWATER.

⁴ UNI-BL (UNIVERZITET U BANJOJ LUCI), CIHEAM-IAMB (CENTRO INTERNAZIONALE DI ALTISTUDI AGRONOMICI MEDITERRANEI), CSIC (AGENCIA ESTATAL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS), ISA (INSTITUTO SUPERIOR DE AGRONOMIA), SYS (SYSMAN PROGETTI & SERVIZI SRL), UNSA (UNIVERZITET U SARAJEVU).

⁵ <https://faster-h2020.eu/wp-content/uploads/2021/05/Final-report-Cluster-meeting-Agri-Nat-Res.pdf>

⁶ <https://agrores.net/en/>

⁷ <https://www.netcompany-intrasoft.com/>

We participated in ERA *Info Day*⁸ event (9.7.). We joined two conferences, "Soils for future under global challenges" organized in Serbia (21-24.9.) and "Agrosym 2021" organized in BiH (7-10.10.)⁹.

ISA organized the first advanced training course "Advanced remote sensing technologies and tools for crop water requirements estimates and irrigation scheduling" in Lisbon (27.9.–1.10.). The 1st CATCHaCORN¹⁰ students' competition was organized by UNSA (24.10.).

The 1st year of experiments was finished. Three master students started their course (1.10.). All project reports for 2021 were sent to EC. The dissemination was an ongoing activity to spread knowledge about the project and to gather and involve target groups in activities.

Project implementation in 2022 - brief overview

UNIBL joined the "World Water Day"¹¹ in Patras in Greece (22.5.) and the "5th International Scientific Conference on Water"¹² in Szarvas in Hungary (22-24.3.). SMARTWATER was presented in Trebinje at "AgroReS 2022"¹³ (26-28.5.). ISA team joined the "ENCONTRO CIÊNCIA"¹⁴ in Lisbon (16-18.5.).

UNSA team organized the 2nd stakeholders' meeting (20.6.). ISA participated in the "National Fair of Agriculture" in Portugal (4-12.6.).

The 2nd summer school "Smart technologies and best practices (technical and practical) for sustainable and environmentally efficient water management in agriculture" was organized by UNSA in Sarajevo (18-22.7.). SMARTWATER was presented at the "International Symposium on Managing Land and Water for Climate-Smart Agriculture"¹⁵ held in Vienna, Austria (25-29.7.). UNSA team organized the first workshop on funding opportunities and proposal drafting in Sarajevo (11-13.10.).

We presented SMARTWATER at three conferences, the first one was held in Velke Bilovice¹⁶ in Czech Republic (6-7.10.), the second one in Ohrid¹⁷ in North Macedonia (12-14.10.) and the third one in Beja¹⁸ in Portugal (18-20.10.).

⁸ https://research-and-innovation.ec.europa.eu/events/horizon-europe-info-days/era-and-widening/july-2021_en

⁹ <https://congress.sdpz.rs/> and <http://agrosym.ues.rs.ba/>

¹⁰ <http://www.smartwater-project.eu/the-first-competition-in-maize-harvesting-catchacorn-event/>

¹¹ <http://www.smartwater-project.eu/world-water-day-22-march-2022-patras-greece/>

¹² <http://www.smartwater-project.eu/5th-international-scientific-conference-on-water/>

¹³ <https://agrores.net/en/>

¹⁴ <https://www.encontrociencia.pt/2022/>

¹⁵ <http://www.smartwater-project.eu/smartwater-project-at-the-international-symposium-on-managing-land-and-water-for-climate-smart-agriculture/>

¹⁶ <http://www.smartwater-project.eu/smartwater-project-at-the-international-conference-on-urban-water-2022/>

CSIC organized the 2nd advanced training course *"Use of innovative technologies and tools for collective and on-demand pressurized irrigation systems"* in Zaragoza (26-30.9.). An academic exchange¹⁹ was organized in December in BiH.

The 2nd CATCHaCORN²⁰ students' competition was organized by UNSA (22.10.). The 2nd year of experiments was finished. Two master students finished their first year of master studies in Italy (at CIHEAM-IAMB) and one master student finished his master course in BiH (at UNSA). All project reports for 2022 were sent to EC. The dissemination efforts continued - all relevant calls, news and posts were prepared and disseminated to target groups.

Project implementation in 2023 - brief overview

In 2023, SMARTWATER project was presented in Serbia (Zlatibor, Čačak and Belgrade) and Brazil (Fortaleza)²¹. UNSA team organized the 2nd (31.1.-3.2.) and the 3rd (22-24.5.) workshop on EU funding and proposal drafting in Sarajevo.

The 3rd summer school *"Adaptation to climate change of agricultural water management sector in BiH"* was organized by UNI-BL in Trebinje (3-7.7). CIHEAM-IAMB organized the 3rd advanced training course *"Crop growth modelling and water productivity for eco-efficient agricultural water management"* in Valenzano, Bari (17-21.7.).

In 2023, academic exchanges were organized in BiH (Sarajevo²²) and Portugal (Lisbon) and during main events, like summer schools and training courses. Training materials from these events are being disseminated²³.

During 2023, significant work with project stakeholders was done by the consortium, in terms of the establishment of the research strategy for sustainable agricultural water management in BiH and based on interviews and workshops with stakeholders in different cities in BiH.

The 3rd CATCHaCORN students' competition was organized by UNSA (3.11.). The 3rd year of experiments was finished. Two master students finished their second year of master studies in Italy (at CIHEAM-IAMB).

¹⁷ <https://isaf2022.isaf.edu.mk/>

¹⁸ <http://www.smartwater-project.eu/smartwater-project-at-ix-national-congress-on-irrigation-and-drainage-in-beja-portugal/>

¹⁹ <https://www.smartwater-project.eu/the-visit-of-professor-todorovic-to-the-university-of-sarajevo-and-banja-luka/>

²⁰ <https://www.smartwater-project.eu/harvest-time-ended-this-weekend-with-catchatcorn2/>

²¹ <https://www.smartwater-project.eu/news-events/>

²² <https://www.smartwater-project.eu/student-exchange-within-the-smartwater-project/>

²³ <https://www.smartwater-project.eu/training-material/>

All project reports for 2023 were sent to EC. SMARTWATER brochure and newsletters for 2023 were prepared and published²⁴. The implemented activities within SMARTWATER project in the period 2021-2023 are presented in Table 1.

Table 1. The overview of activities within SMARTWATER project (2021-2023)

no.	Activity type	Accomplished	Project report reference
1	advanced training courses	3/3	D2.2*, D2.4, D2.7
2	summer schools	3/3	D2.1, D2.3, D2.6
3	joint research activities (experiments)	3/3	D3.1, D3.2, D3.3
4	stakeholders' meetings (roundtables)	2/3	D4.1, D4.3
5	post-graduate MSc programs	3/3	D2.8, D2.9, D2.10
6	mutual staff exchanges	10/13	D3.1, D3.2, D3.3
7	hands-on workshops on R&I	3/3	D2.5
8	international conferences	25/3	D3.1, D3.2, D3.3
9	smart water management tools	2/2	D3.1, D3.2, D3.3

* D = deliverable (report)

Joint experimental studies and publications – basic considerations

Within WP3 experiments at two locations in BiH (Aleksandrovac and Butmir) were performed. The investigated plant species was maize (*Zea mays* L.), hybrid BL 43 (FAO 400 group). The RCB design included two factors, irrigation (3 irrigation levels) and fertilization (2 nitrogen levels). All data were collected and interpreted. Some scientific publications are already available at online repository (Zenodo, 2024) but the consortium is preparing the remaining publications, tackling the main project topics.

The extension of project life - activities in 2024

After the amendment approval by EC, SMARTWATER project life will continue until June 2024. The forthcoming activities include the implementation of remaining academic exchanges, the 3rd stakeholders' meeting, the scientific publishing process and participation in international conferences in order to disseminate SMARTWATER activities.

SMARTWATER team will organize an international workshop in BiH in the period May/June 2024 for all stakeholders in order to present project achievements. We are inviting all interested actors to participate in this event²⁴.

²⁴ <https://www.smartwater-project.eu/>

Conclusions

During the implementation of SMARTWATER project in the period 2021-2023 most pre-planned activities were finished. All project reports for this period are prepared and published. Dissemination was done through different communication channels and is ongoing. In 2024 the consortium will aim to implement the remaining activities in order to fulfill the main project objectives i.e. to upgrade networking and research between project partners and stakeholders and to increase competency and fund raising skills of formed project teams.

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