

D5.5: 1st course training material SMARTWATER



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Partners involved: **UNI-BL, CIHEAM-IAMB, CSIC, ISA, SYS, UNSA**

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Abstract

This report consists of a various training material from theoretical and practical sessions presented and discussed during the first Advanced Training Course (ATC) within the SMARTWATER project. The first ATC was held in Lisbon (Portugal), from September 27th to October 1st following the hybrid model organization. The course was hosted by the University of Lisbon, School of Agriculture, Portugal (ISA). Annexes I, II, III and IV that are included present an integral part of the report.

Acronyms

The following table provides definitions for acronyms and terms relevant to this document.

Acronym	Meaning
EU	European Union
EC	European Commission
BiH	Bosnia and Herzegovina
UNI-BL	University of Banja Luka
CIHEAM-IAMB	Mediterranean Agronomic Institute of Bari
CSIC	Consejo Superior de Investigaciones Científicas
ISA	Instituto Superior de Agronomia
SYS	Sysman Progetti & Servizi SRL
ESR	Early Stage Researcher
ATC	Advanced Training Course
FAO56	Crop evapotranspiration - Guidelines for computing crop water requirements - FAO Irrigation and drainage paper 56
SIMDualK _c	Software Application for Soil Water Balance Simulation
K _c	Crop coefficient
K _{cb}	Basal crop coefficient
K _e	Soil evaporation coefficient
ForestWISE CoLAB	Collaborative Laboratory for Integrated Forest and Fire Management
PERIN-FCT	Portugal in Europe Research and Innovation Network
IDP	Information Dissemination Platform
Term	Definition
Approver	Has the authority to confirm a project process or a deliverable and allow the project manager to move forward.



Table of Contents

REVISION HISTORY	2
APPROVAL PROCEDURE	2
ELECTRONIC FILING PROCEDURE	2
ABSTRACT	3
ACRONYMS.....	3
1. INTRODUCTION	5
2. TRAINING MATERIALS - PART 1.....	5
3. TRAINING MATERIALS - PART 2.....	6
4. TRAINING MATERIALS - PART 3.....	6
5. TRAINING MATERIALS - PART 4.....	7
ANNEXES	7
WEB LINKS.....	7

1. INTRODUCTION

The first Advanced Training Course within the H2020 SMARTWATER project (WP2, task D2.1) was organized by the School of Agriculture of the University of Lisboa (ISA/ULisboa). The event took place in Lisbon, Portugal, from September 27th to October 1st, 2021, following the hybrid model organization. The main focus of ATC was on the "Advanced remote sensing technologies and tools for crop water requirements estimates and irrigation scheduling".

The first day of ATC (Monday, September the 27th 2021) consisted of theoretical presentations that were provided to participants:

- Mihajlo Marković (UNI-BL), Project implementation, status and perspectives;
- Teresa A. Paço (ISA-ULisboa), ISA participation in SMARTWATER;
- Nataša Čereković (UNI-BL), Joint experimental studies - status and perspectives;
- Teresa A. Paço (ISA-ULisboa), Advanced Training Course Programme.

These presentations represent only the introduction to the working sessions, the SMARTWATER project progress and experimental work status, therefore they are not included as a part of the training materials.

Training materials represent the outcomes from the ATC's theoretical and practical sessions.

2. TRAINING MATERIALS - Part 1

Training materials from the second day of the advanced course (Tuesday, September the 28th 2021) consisted of theoretical and practical presentations that were provided to participants:

- Teresa A. Paço (ISA-ULisboa), Crop water requirements: from direct measurement to tabled values (pages 11-70 in .pdf);
- Paula Paredes (ISA-ULisboa), Modelling crop water requirements with the FAO56 approach (pages 71-126 in .pdf);
- Paula Paredes (ISA-ULisboa), Modelling crop water requirements with the FAO56 approach - hands on activity (pages 127-202 in .pdf).

The sessions were held by experts from ISA (Lisbon, Portugal). Theoretical presentations exposed the basic principles of the crop water requirements, while practical exercises, guided by Paula Paredes (ISA) were performed together with the participants, early stage researchers (ESR). The practical part referred to the use of the SIMDualK_c software model for the soil water balance simulation and the crop evapotranspiration estimation and irrigation scheduling using the dual crop coefficient approach ($K_{cb} + K_e$).

These presentations are shown in the Annex I of the report (see enclosed).

3. TRAINING MATERIALS - Part 2

Training materials from the third day of the advanced course (Wednesday, September the 29th 2021) consisted of theoretical presentations that were provided to participants:

- Isabel Pôças (ForestWISE CoLAB), Remote sensing techniques and irrigation56 – state of the art (pages 203-233 in .pdf);
- Isabel Pôças (ForestWISE CoLAB), Using satellite data to estimate evapotranspiration (pages 234-264 in .pdf);
- Maria Rosário Cameira (ISA-ULisboa), Assessment of crop sustainability by modelling (pages 265-313 in .pdf);
- João Rolim (ISA-ULisboa), Irrigation requirements modeling in a climate change context (pages 314-356 in .pdf).

The sessions were held by experts from ISA, Lisbon, Portugal and ForestWISE CoLAB (Collaborative Laboratory for Integrated Forest and Fire Management), Vila Real, Portugal. The first part of the lectures presented were part of the theoretical presentations mostly referred to the remote sensing techniques for estimating crop evapotranspiration in the context of irrigation management. The second part referred to the assessment of crop sustainability, environmental issue assessment and climate change modeling in the context of the climate change and future irrigation requirements. The theoretical part was followed with the presentation of the different case studies from Portugal.

These presentations are shown in the Annex II of the report (see enclosed).

4. TRAINING MATERIALS - Part 3

Training materials from the fourth day of the advanced course (Thursday, September the 30th 2021) consisted of the following theoretical and practical presentations that were provided to participants:

- Isabel Pôças (ForestWISE CoLAB), Sentinel 2 for estimating basal crop coefficients - hands on activity (pages 358-378 in .pdf);
- Mariana Mota (ISA-ULisboa), Determination of plant stomata density for different levels of water stress - hands on activity;
- Milica Čolović (CIHEAM-IAMB), Application of remote sensing for precision soil and crop management and efficient and sustainable use of water and nitrogen (pages 379-407 in .pdf).

The first hands on activity related to the remote sensing data for estimation of K_{cb} using vegetation indices from Sentinel-2 and elaborated with QGIS 3.16. The second hands on activity presented an estimation of the plant stomata density on the zucchini leaves. The third session was the case study presentation on the application of remote sensing for precision soil and crop management and efficient and sustainable use of water and nitrogen for sweet maize crop field experiment performed in Italy. The sessions were held by experts from ISA (Lisbon, Portugal) and CIHEAM-IAMB (Bari, Italy).

These presentations are shown in the Annex III of the report (see enclosed).

5. TRAINING MATERIALS - Part 4

Training materials from the fifth day of ATC (Friday, October the 1st 2021) consisted of theoretical presentations that were provided to participants:

- Rui Munhá (PERIN-FCT), Western Balkans in the spotlight: opportunities for collaborative projects (pages 408-427 in .pdf);
- David Fanguero (ISA-ULisboa), Writing of peer reviewed scientific publications (pages 428-473 in .pdf).

These sessions were held by experts from PERIN-FCT and ISA (Lisbon, Portugal).

Opportunities, priorities and main challenges for collaborative EU projects between widening countries (BiH and Portugal) through the Horizon Europe project were presented and discussed in the first session.

The second session was devoted to the art of the scientific writing of peer reviewed scientific publications, the main challenges and strategies.

These presentations are shown in the Annex IV of the report (see enclosed).

Annexes

The 1st advanced course training material Annexes are attached accordingly:

- I. Theoretical and practical presentations from the second day (Tuesday) (pages 11-202 in .pdf);
- II. Theoretical presentations from the third day (Wednesday) (pages 203-356 in .pdf);
- III. Theoretical and practical presentations from the fourth day (Thursday) (pages 358-407 in .pdf);
- IV. Theoretical presentations from the fifth day (Friday) (pages 408-473 in .pdf).

Web links

More detailed documentation regarding the SMARTWATER project ATC training materials will be stored at the IDP tab database on the official project website <http://www.smartwater-project.eu/>



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УНИВЕРЗИТЕТ У БАЊОЈ ЛУЦИ
UNIVERSITY OF BANJA LUKA

Promoting SMART agricultural WATER management in Bosnia and Herzegovina - SMARTWATER

SMART WATER

PROMOTING SMART AGRICULTURAL WATER MANAGEMENT
IN BOSNIA AND HERZEGOVINA

The first Advanced Training Course - Programme *Advanced remote sensing technologies and tools for crop water requirements estimates and irrigation scheduling*

Lisbon, Portugal

Instituto Superior de Agronomia | Universidade de Lisboa
(ISA | Ulisboa, *Salão Nobre*/Noble Hall)

LEAF – Linking Landscape, Environment, Agriculture and Food
27.09.2021 - 01.10.2021

Participants:

- Early-stage researchers and scientists from **UNI-BL** (Univ. Banja Luka) and **UNSA** (Univ. Sarajevo) (**online**)
- ISA students (presential, limited to room capacity, registration before 22.09.2021: https://docs.google.com/forms/d/e/1FAIpQLScHQIUxyMUUkieswFaDXjTy1NqL2JLGbnbXLhpT3npxihcWIw/viewform?usp=sf_link.)



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УНИВЕРЗИТЕТ У БАЊОЈ ЛУЦИ
UNIVERSITY OF BANJA LUKA

Promoting SMART agricultural WATER management in Bosnia and Herzegovina - SMARTWATER

The first Advanced Training Course
Lisbon, Portugal
27.09.2021 - 01.10.2021

Advanced remote sensing technologies and tools for crop water requirements estimates and irrigation scheduling **PROGRAMME**

Monday, September 27, 2021

🕒	TOPIC	WITH
10:00 - 10:30	Registration for presential participants - Noble Hall -	
10:30 - 11:00	WELCOME SPEECH	António Guerreiro de Brito President of ISA (University of Lisbon) Mihajlo Marković Project Coordinator (University of Banja Luka – BH)
11:00 - 11:30	Project implementation - status and perspectives -	Mihajlo Marković UNI-BL
11:30 - 12:00	ISA participation in SMARTWATER	Teresa A. Paço ISA-ULisboa
	Short break	
12:15 - 12:45	Joint experimental studies - status and perspectives -	Nataša Čereković UNI-BL
	Lunch	
14:30 - 15:00	Advanced Training Course Programme	Teresa A. Paço ISA-ULisboa

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SMARTWATER — H2020-WIDESPREAD-2018-2020 / H2020- WIDESPREAD-2020-5



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УНИВЕРЗИТЕТ У БАЊОЈ ЛУЦИ
UNIVERSITY OF BANJA LUKA

Tuesday, September 28, 2021

🕒	TOPIC	WITH
09:30 - 10:30	Crop water requirements: from direct measurement to tabled values	Teresa A. Paço ISA-ULisboa
	Discussion	
10:45 - 11:45	Modelling crop water requirements with the FAO56 approach *	Paula Paredes ISA-ULisboa
	Discussion	
	Lunch	
14:30 - 16:00	Modelling crop water requirements with the FAO56 approach - Hands on activity *	Paula Paredes ISA-ULisboa
	Discussion and wrap up	

*this activity requires the use of a computer

Wednesday, September 29, 2021

🕒	TOPIC	WITH
09:30 - 10:30	Remote sensing techniques and irrigation – state of the art	Isabel Pôças ForestWISE CoLAB
	Discussion	
10:45 - 11:45	Using satellite data to estimate evapotranspiration	Isabel Pôças ForestWISE CoLAB
	Discussion	
	Lunch	
14:30 – 15:30	Assessment of crop sustainability by modelling	M^a Rosário Cameira ISA-ULisboa
	Discussion	
15:30 – 16:30	Irrigation requirements modeling in a climate change context	João Rolim ISA-ULisboa
	Discussion and wrap up	