WATERAGRI

D1.5: Workshop 2 Report

April/2021

WP 1: Farmer Engagement

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Abstract:	The WATERAGRI Workshop 2 was organized in Month 11 of the project to provide internal and external stakeholders with an overview of the WATERGAGRI framework and obtain their feedback. This document presents the planning, execution and results of the workshop.

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Dissemination Level		
PU	Public	

WATERAGRI Consortium			
Participant Number	Participant organisation name	Short name	Country
1	LUNDS UNIVERSITET	ULUND	SE
2	EDEN TECH	EDEN	FR
3	FORSCHUNGSZENTRUM JULICH GMBH	FZJ	DE
4	TEKNOLOGIAN TUTKIMUSKESKUS VTT Oy	VTT	FI
5	DEBRECENI EGYETEM	UNIDEB	HU
6	ALCHEMIA-NOVA GMBH	ALCN	AT
7	AGROGEO AGARFEJLESZTO-FOLDTANI-FOVALLALKOZO KORLATOLT FELELOSSEGU TATRSASAG	AGROGEO	HU
8	UNIVERSITAET FUER BODENKULTUR WIEN	BOKU	AT
9	ALMA MATER STUDIORUM UNIVERSITA DI BOLOGNA	UNIBO	IT
10	THE UNIVERSITY OF SALFORD	USAL	UK
11	COCONSORZIO DI BONIFICA DI SECONDO GRADO PER IL CANALE EMILIANO ROMAGNOLO CANALE GIANDOTTI	CER	IT
12	CENTRUM DORADZTWA ROLNICZEGO W BRWINOWIE	CDR	PL
13	INOSENS DOO NOVI SAD	INOSENS	RS
14	UNIWERSYTET PRZYRODNICZY WE WROCLAWIU	UPWr	PL
15	BAY ZOLTAN ALKALMAZOTT KUTATASI KOZHASZNU NONPROFIT KFT	BZN	HU
16	VULTUS AB	VULTUS	SE
17	TECHNISCHE UNIVERSITEIT DELFT	TU DELFT	NL
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List of Abbreviations and Acronyms	
EU	European Union
WP	Work Package
WS	Workshop
TRL	Technology Readiness Level

Executive Summary

The WATERAGRI project aims to develop sustainable solutions for water and nutrient retention. Given the wide range of solutions, it could be difficult for the end-users to assess which solutions are appropriate for them given their local context and challenges. To address this problem, the project will develop a framework that will enable stakeholders to identify, select and combine appropriate solutions, technologies, methods, and models for their specific challenges.

The second WATERAGRI stakeholder engagement workshop (i.e., WS2) was conducted on 25th March 2021. This workshop presented the WATERAGRI framework to relevant stakeholders, together with associated methods and solutions that project partners are working on. This was done to obtain early feedback on the framework development. This report presents the planning, the execution, and the results of this workshop.

WS2 was planned to be organized as a physical meeting but had to be organized as a virtual meeting due to the current pandemic. The workshop organization was led by the WS2 steering group consisting of the WS2 organizer, CER, and representatives from UNINE as framework developers, next to OULU, ULUND, and TUDELFT. A total of 140 invitations were sent out by CER outlining the purpose of the workshop, the draft agenda alongwith supporting material to provide more background about the project's solutions. On the day of the workshop, 25th March 2021, 72 participants across all 10 WATERAGRI case studies attended the meeting.

The workshop was set up as an online meeting in MS Teams. The meeting consisted of two main sessions; a plenary session followed by breakout sessions. In the plenary session, the WATERAGRI framework concept and its elements were presented first to the stakeholders. This was followed by the presentations of selected 6 WATERAGRI solutions. After the plenary part, eight breakout sessions were organized around the following topics: 1) key issues and needs concerning WATERAGRI solutions 2) stakeholder's preferences for solutions 3) ways of working together to implement the solutions. After the breakout sessions, rapporteurs from all breakout sessions reported back to the plenary session summarizing the key insights and findings from the discussion. This was followed by closing comments by the workshop organizer.

The WATERAGRI WS2 was successfully conducted. The WATERAGRI framework was presented to the stakeholders for their feedback and breakout room discussions revealed important information about stakeholders' requirements and needs regarding the solutions, their preferences, and expectations about future collaboration. Stakeholders highlighted their interest in knowing the value for money of the proposed solutions. They further revealed that solutions should offer the possibility for customization to support integration with their existing cropping systems and business models. Future engagement strategies should focus on strengthening the dialogue between solution providers and the farming community to ensure that technological development takes into account the local context and challenges of the case study while keeping the farmers informed about the anticipated outcomes of the solutions. New ways of engagement need to be incorporated to ensure that farmers can be engaged in their native language and through a non-virtual medium while adhering to the COVID-19 restrictions.

1 Introduction

The WATERAGRI project aims to develop sustainable solutions for water retention and nutrient recycling to improve the efficiency of agricultural practices. The project started in May 2020 and is planned to be completed over 48 months. An important feature of this project is the development of a framework that will enable stakeholders to evaluate which technologies, methods, and models are most suited for their specific context and challenges.

In this context, a workshop was organized on 25th March 2021 to obtain feedback on the planned WATERAGRI conceptual framework and the related overall methodology. This workshop was the 2nd in a series of 4 workshops planned between 2020-2024 (hereafter referred to as 'Workshop 2'). The purpose of these workshops is to engage relevant stakeholders, disseminate the project's methodology and results and obtain feedback on them. The 1st WATERAGRI workshop was held on 5th October 2020, where relevant external stakeholders were identified and invited and a general overview of the WATERAGRI project was provided to them (see Mittal & Dahal, 2020 for further details).

Workshop 2 dived deeper into the overall methodology of the WATERAGRI project including relevant metrics and tools. The objective of this workshop was to present the WATERAGRI framework, together with associated methods, metrics, and tools/solutions to stakeholders and obtain early feedback. Due to the Covid-19 situation, the workshop was held online via video conferencing. This report summarizes the outcomes of Workshop 2.

This report consists of 5 sections. In section 1, we introduce the project background and the motivation to organize the 2nd WATERAGRI workshop. In section 2, we discuss the key features of the proposed WATERAGRI framework and how it was presented at the workshop. In section 3, the agenda and organization of the workshop are presented in detail. Section 4 presents the results of the workshop and Section 5 summarizes the key messages of the workshop along with lessons learned and next steps.

2 WATERAGRI Framework

2.1 Objectives

Multiple technological solutions & innovations for improved water retention and more sustainable agricultural water resources management are developed in the WATERAGRI project. Given the wide range of solutions provided, it is difficult to assess which technologies are suitable for specific stakeholders. The overarching goal of the framework is to provide an easy-to-use tool that allows the stakeholders (e.g., farmers of the WATERAGRI case studies, but also farmer associations, local authorities, research institutes) to identify, select and combine appropriate solutions, technologies, methods, and models for their specific challenges. Specifically, the following points are covered by the framework:

1. To identify promising technologies for each case study catchment using modeling approaches;

2. To integrate online sensor data from catchments to the geo-database;
3. To assess the effect of soil water retainer on a catchment scale for selected WATERAGRI catchments;
4. To develop a data assimilation framework that combines physically-based models with a geo-database and the online sensors; and
5. To provide a visualization platform to make the model results (both simple and complex) easily accessible to stakeholders.

2.2 Components

A web-based decision support framework (see Figure 1) will be designed to guide stakeholders in the evaluation of which WATERAGRI technologies and solutions could be deployed in their context. The web-based decision support framework is based on three pillars, namely documentation of the solutions (solution guides) and a geo-database of the case study catchments, evaluation tools (including different types of numerical models and a data-assimilation approach for selected catchments) which feed into a decision support system. Finally, web-based visualization will support the user with using the framework.

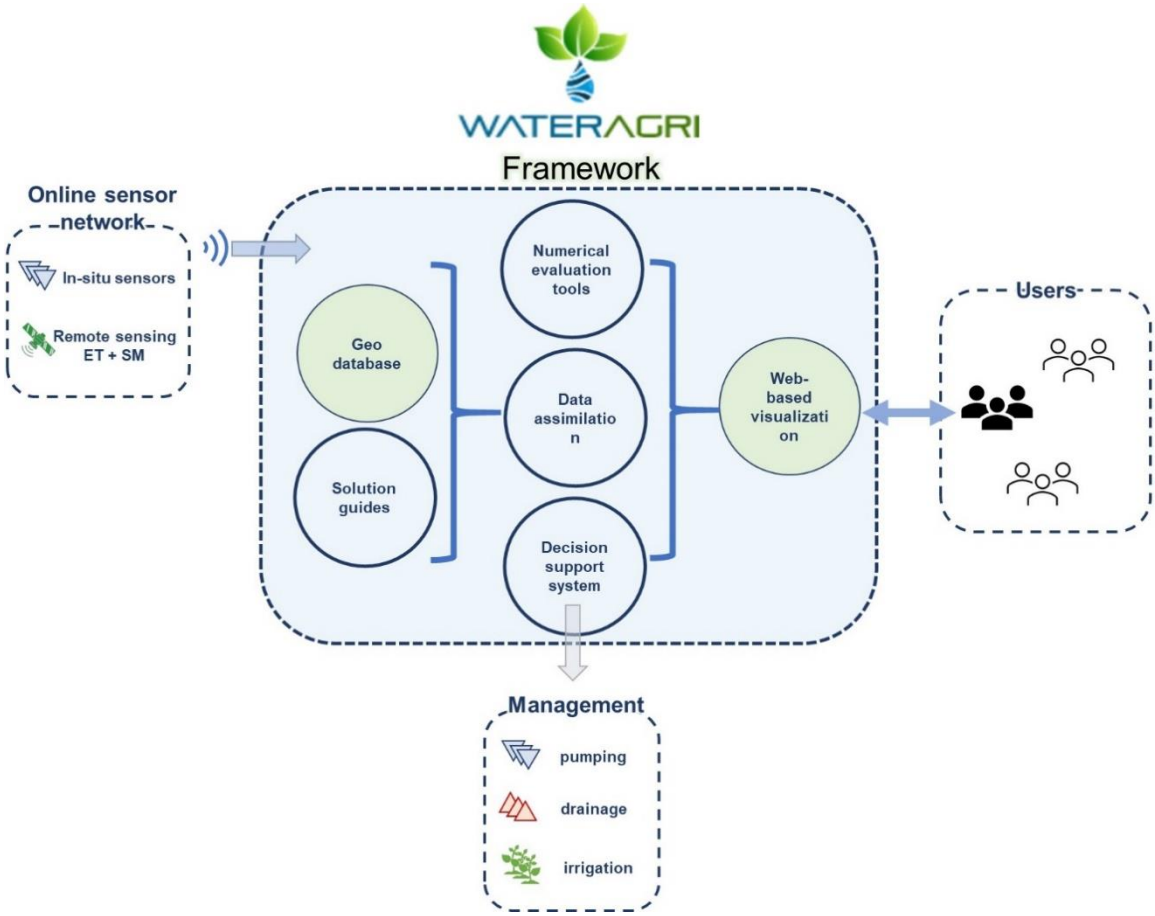


Figure 1: Likely structure of the framework.

The geodatabase and the solution guides provide essential information concerning solutions and the conditions in the individual catchments. Numerical models and the data assimilation approach allow assessing the solutions. The visualization tools provide the results of the evaluation tools and are linked to a decision support system. (ET = evapotranspiration; SM = soil moisture)

Note that the structure of the framework is likely to evolve during the upcoming project development.

2.2.1 Documentation and Geo-database

A set of documents is provided explaining in detail the water management innovations and solutions developed and tested in the project. These documents will provide a technical overview of the systems provided. If a stakeholder is implementing a given solution, the general documents are expected to be adjusted by providing, for example, details on efficiency, and adjusted estimation of cost, and any information required for the implementation of the given solution. The documents are written in a way that no special knowledge or previous experience is required to understand the concepts, implementation, and application of the suggested solutions. The geo-database contains information on the individual catchments.

2.2.2 Evaluation tools

The evaluation tools are based on numerical models. Numerical models allow the efficiency of a given solution under consideration of the local conditions to be estimated. Given the different solutions developed and proposed, different types of numerical models are in development. For example, farm-constructed wetlands have a large potential to significantly increase the efficiency of water and nutrient management for numerous stakeholders. Important questions a stakeholder might have in this regard are the efficiency, or how much land area is required to implement the solution. The numerical model used to evaluate these kinds of questions is a conceptual model based on a mass balance approach. Diverse inputs are required from the stakeholders, including the quantity and intensity of precipitation events, agricultural runoff, or the parameters describing the water quality (e.g., nitrate or phosphate concentrations or temperature).

Another example is the water retainer technology. Depending on the soil type, the efficiency of water retainers as proposed in the WATERAGRI project greatly varies. How a specific water retainer product affects the retention properties of a given soil (by alteration of the soil water retention function) is evaluated on a conceptual basis in a first step. In a second step, the modified water retention function will be implemented in a simple numerical model simulating soil water fluxes in 1-D, that is, in the vertical direction only. In a third step, the efficiency of different water retainers from field to catchment scale will be evaluated using fully coupled and physics-based numerical surface water-groundwater flow models for selected catchments. These models simulate water flow on the surface, in the unsaturated zone as well as in the saturated soil in 3-D and can take into account spatially varying precipitation, land use, evapotranspiration, and hydro(geo)logical properties.

As a third example, the framework will also provide access to the results of data assimilation. In data assimilation, the data that are available via the online sensor network, the remote sensing pipeline, and the geo-database will be integrated into near-real-time simulations of fully coupled surface water-groundwater flow models according to statistically optimal procedures. These state-of-the-art models will be constructed for two selected case study sites and aim to provide continuous forecasts of spatially distributed groundwater levels and soil moisture, allowing to optimize the local water management via irrigation and drainage scheduling.

Note that not all solutions will be evaluated with numerical models.

2.2.3 Visualization

The web-based decision support framework will be implemented in the AGRICOLUS service platform. In addition to the existing farm management options that are provided via AGRICOLUS, the platform will also enable management and visualization of the different solutions that are part of the framework. Alongside the agrometeorological data that is collected via the online sensor network and the remote sensing platform, the web-based framework will provide visualizations of the results of the simple water balance simulations as well as the hydrological forecasts produced via data assimilation.

2.3 Outputs

As described above, the main outputs of the framework are the visualization platform, the results presented therein, and the access to the documentation of the WATERAGRI solutions. The results of the numerical models will be accessible via the online platform and provide important information concerning day-to-day management. The way the output is designed is crucially dependent on the input of the stakeholders. Refer to point 4.3 concerning this important aspect.

3 Workshop

3.1 Workshop 2 agenda

Preparatory activities

The preparation of the workshop agenda, and in more general terms of the entire workshop, took months of brainstorming and discussions, first among the WP1 partners in charge to carry out that task, and then involving also WATERAGRI Solution Providers and Case Study Owners. A list of the principal meetings, all carried out virtually, is reported in Table 1. The WS2 steering group was composed of A. Battilani (CER, Organiser), Zoran Kapelan (TU Delft, WP1 Leader), Tamara Avellán (Oulu University), Philip Brunner (UniNe), Oliver Schilling (UniNe), Aashna Mittal (TU Delft), and Miklas Scholtz (ULund, Project Coordinator).

Table 1: Preparatory meetings

Date	Participant	Main Activity
20 January 2021	Steering Group	Start of activities
27 January 2021	CER, UniNE	WATERAGRI Framework alignment and state of art
03 February	Steering Group	Workshop setup, topics, and first draft agenda
24 February 2021	Steering Group	WATERAGRI Solution Providers engagement and updating the stakeholder list, “save the date message”.
03 March 2021	Steering Group	How to stimulate participation and discussion

10 March 2021	Steering Group, Inosens, Case Study Owners	INOSENS support for communication, social media, etc. Case study owner's involvement. Solution Providers selection.
11 March 2021	CER	MS TEAMS internal test and breakout rooms first organization
12 March 2021	CER	MS TEAMS test
17 March 2021	Steering Group, Inosens, Case Study Owners, Solution Providers	Final WS organization (last details)
24 March 2021	Steering Group, Inosens, Case Study Owners, Solution Providers	Run-through session for keynote speakers and final test

Selection of WATERAGRI solutions

The steering group decided to focus on only 6 WATERAGRI solutions, as the full portfolio was already presented during the first stakeholder workshop (WS1). The intention was to let stakeholders indicate what solution they found most interesting through a survey and then invite solution providers to point out practical aspects of the selected ones. These solutions were then proposed as components of the overall framework.

The selection process was launched about 7 weeks before the meeting. The links to the presentations made for WS1 were included in the invitation letter, as well as the link of the solution interest survey: https://forms.gle/tVnz1AjdXp4sJW1Y8. The contents of the survey can be found in Appendix 7.2. According to the survey results, the most promising solutions were the top 6 solutions in Figure 2. Since the solutions - precision irrigation system, and irrigation management, and agrometeorological solution, were developed by the same organization, AGRICOLUS, these were clubbed into a single presentation. The Steering Group further considered it appropriate to present the relevance and applicability of one additional solution which, because of its high technicality, is not easily understandable for non-experts. Therefore, the dewaterability estimation test was also selected for presentation. The solutions included in the agenda were the following:

1. Irrigation management (Agricolous, Diego Guidotti)
2. Farm constructed wetlands (BOKU/ULund, Suhad Almuktar)
3. Drainage systems (ALCN, Ines Kantauer)
4. Remote sensing pipeline (Vultus, Haidi Abdullah)
5. Water retainer product (Bayzoltan/Water&Soil, Richard Vattay)
6. Dewaterability test apparatus (Usal/ULund, Miklas Scholz)

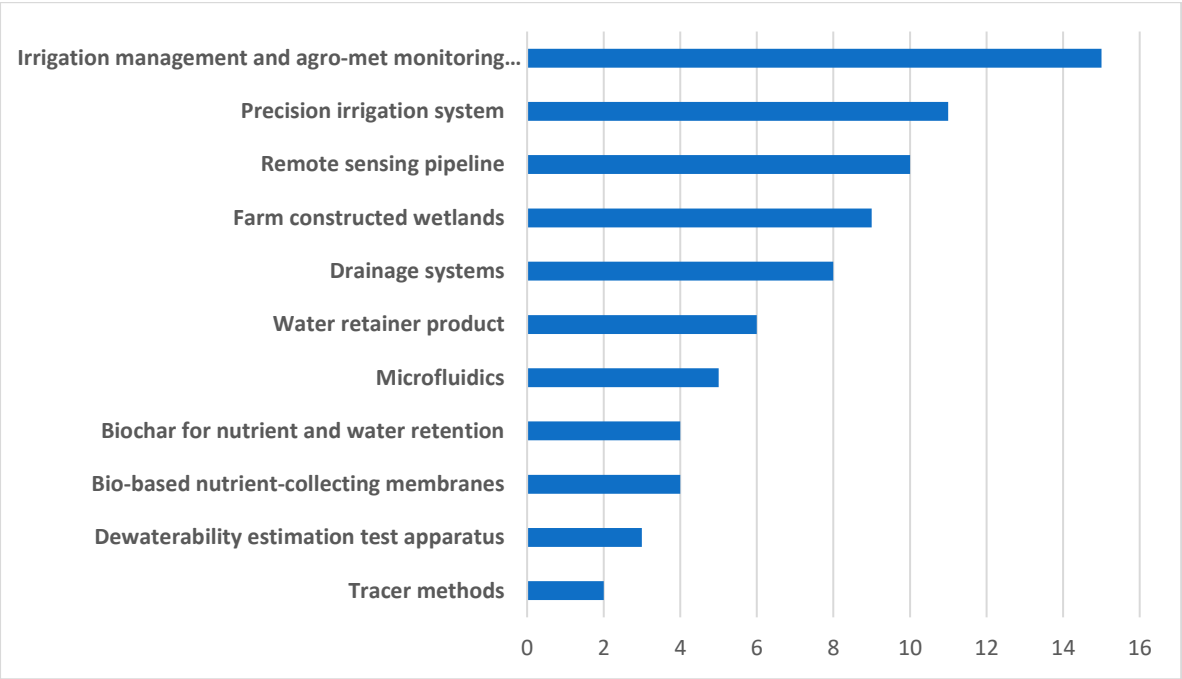


Figure 2: Results of the WS2 solution interest survey

Presenters were asked to use plain, non-technical language, in a layperson report style. A power point template was circulated among solution providers with the key questions they were requested to answer provided in a template form (see Appendix 7.2). The presentations were sent in advance to the Steering Committee, which had discussed with the speakers each presentation to ensure the comprehensibility also for non-experts and the practical value of the information provided. Also, all presentations were harmonized to fit with the presentation of the framework. A list of possible questions regarding the relationship between the solutions and the framework developers was sent to all presenters.

Before the solutions were presented, the framework was explained and contextualized for the audience by Philip Brunner (UniNE). The essential elements of the presentation have been documented in section 2. The presentation was followed by a discussion of approximately 30 minutes. The WATERAGRI solutions and the role they are expected to play as part of the WATERAGRI Framework and in a broader European context were then presented by Adriano Battilani (CER).

The final WS2 agenda is shown in Table 2:

Table 2: WS2 agenda

Time	Topic	Moderator/Speaker
9:30 - 9:45	Welcome and introduction to the workshop	*M. Scholz* (LUNDS UNIVERSITET), *A. Battilani* (CONSORZIO DI BONIFICA DI SECONDO GRADO PER IL CANALE EMILIANO ROMAGNOLO CANALE GIANDOTTI), *Z.Kapelan* (TECHNISCHE UNIVERSITEIT DELFT)
9:45 -10:00	WATERAGRI framework presentation	*P. Brunner* (UNIVERSITE DE NEUCHATEL)
10:00 -10:30	Plenary discussion about the framework	*P. Brunner* (UNIVERSITE DE NEUCHATEL)
10:30 -10:45	Introduction to framework solutions	*A. Battilani* (CONSORZIO DI BONIFICA DI SECONDO GRADO PER IL CANALE EMILIANO ROMAGNOLO CANALE GIANDOTTI)
10:45 -11:15	Presentations of selected solutions - Session 1	Remote sensing Pipeline (Vultus AB) Farm Constructed Wetlands (LUNDS UNIVERSITET / UNIVERSITAET FUER BODENKULTUR WIEN) Irrigation Management (AGRICOLUS S.R.L.)
11:15 - 11:30	Comfort Break	
11:30 - 12:00	Presentations of selected solutions - Session 2	Drainage Systems (ALCHEMIA-NOVA GMBH) Water Retainer Product (BAY ZOLTAN ALKALMAZOTT KUTATASI KOZHASZNU NONPROFIT KFT) Dewaterability Estimation Test Apparatus (THE UNIVERSITY OF SALFORD / THE UNIVERSITY OF SALFORD)
12:00 - 13:00	Breakout sessions (discussion on three pre-specified topics related to framework and solutions)	Moderator, Rapporteur: • Italian: G. Chiari, A. Battilani • German: M. Regelsberger, I. Kantauer • French: R. Reau • English: Z. Kapelan, A. Mittal • Polish: W. Fiałkiewicz, S. Puculek • Hungarian: E. Buday-Bódi • Finnish: B. Klove • Swedish: G. Ramel
13:00 - 13:30	Feedback from sessions and wrap-up	A. Battilani (CONSORZIO DI BONIFICA DI SECONDO GRADO PER IL CANALE EMILIANO ROMAGNOLO CANALE GIANDOTTI)

Selection of invitees

The invitees were indicated by the case study owners starting from the WATERAGRI Stakeholders list (WP1) and from the list of invitees prepared for the WS1. The case study owners were asked to revise and extend the WS1 mailing list.

This process resulted in a list of 140 invitees (63 Consortium Members, 77 External Stakeholders) for all case studies (Appendix 7.3.1). A “Save the Date” invitation was sent via email by CER (Appendix 7.4), followed by two reminders/update messages and a final request for registration to the MS TEAMS meeting.

In parallel, INOSENS launched a promotional campaign on social media (Figure 3) resulting in an additional 14 registrations from across the globe (Turkey 1; Ethiopia 1; India 4; Nepal 1; Pakistan 3; Philippines 1; Egypt 1; Uganda 1; Vietnam 1)

Figure 3: WS2 social media campaign

3.2 Setup and Execution

The workshop was virtually hosted by CER on the MS TEAMS platform. A total of 72 participants were connected at the beginning of the workshop out of which 41 were non-consortium members (Appendix 7.3.2). Meeting screenshots were taken during the meeting with the consent of the participants, and Figure 4 shows some of the participants captured at the end of the workshop.

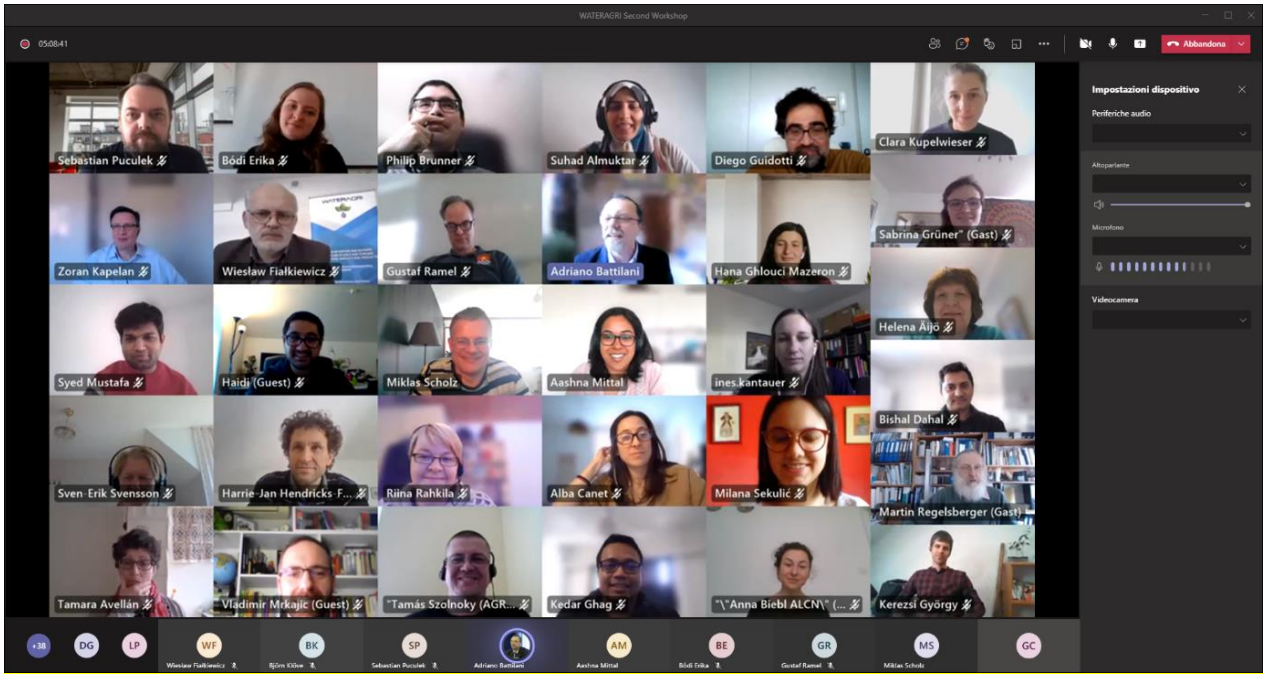


Figure 4: WS2 participants snapshot.

The workshop was divided into two main sections:

1. the plenary session, consisting of the introduction and the presentation of the WATERAGRI framework, as well as the final synthesis and take-home messages;
2. the local language breakout sessions.

Plenary session

The plenary session aimed to explain and present the WATERAGRI Framework concept and to give elements to the stakeholders to understand how and why the solutions developed by the project members will be incorporated into the framework. The workshop introduction (M. Scholtz - ULund; A. Battilani – CER; Z. Kapelan – TUDelft) was intended to welcome guests and to frame the workshop activities, providing the WATERAGRI project view about the necessity to develop a robust framework. The presentation of P. Brunner was addressing the main questions: Why a Framework?; What can the framework deliver?; What does the framework consist of (see section 2)?. The presentation was followed by a discussion. The presentation of A. Battilani covered the dynamic socio-economic and productive context in which the WATERAGRI solutions and framework will be deployed. This was followed by the presentations of the solution providers. All presentations of the plenary session can be found in Appendix 7.5. The plenary session resumed after the breakout room discussions.

Breakout sessions

The Steering Group agreed on the need to let the stakeholders interact in the languages of the case study areas, or otherwise offer the opportunity to join an International Room where the language was English. Stakeholders were grouped according to their local or otherwise preferred language. German-speaking stakeholders from Austria, Germany, and Switzerland were grouped into a single breakout room. The International room hosted stakeholders and partners from the Netherlands and other countries.

In total, 8 breakout rooms were organized. 7 break-out rooms allowed for discussions to be held in the local languages of the case studies. Attendees were asked to indicate their preference in the registration form (Figure 5). An “International” room was also organized for English-speaking attendants.

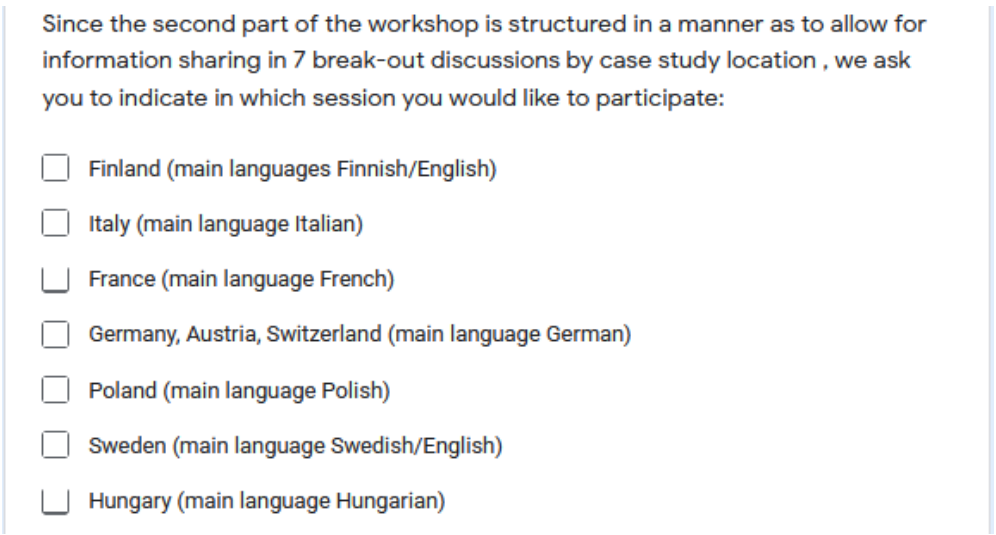


Figure 5: WS2 break out rooms

A facilitator and a rapporteur were assigned to conduct the discussions in each breakout room. The facilitator was responsible for leading the discussion in the group by stating the discussion prompt, clarifying the responses of the stakeholders, keeping a track of time, and ensuring that each stakeholder gets an opportunity to speak. The rapporteur documented the stakeholder responses and reported the discussion outcomes in the plenary. From the synthesis of breakout rooms, key points and take-home messages were then offered to the participants.

4 Results and Discussions

4.1 Breakout room participants and summary

Participation in breakout rooms is shown in Table 3. Participants are divided into Project Partners (project stakeholders) and External Stakeholders. The large majority of breakout room attendees, about two-thirds, were project partners. However, external stakeholders representing farmers, farmer associations, and decision-makers also attended the breakout room discussions although with an uneven geographical distribution. External stakeholders were mostly from Poland, Austria, Germany, France, and Switzerland. In Italy, an additional round of phone calls was carried out after the meeting facilitating personal discussion with local relevant stakeholders.

Table 3: Number of breakout room participants

	International	Finnish	German	Polish	Italian	French	Hungarian	Swedish
Project Stakeholders	17	1	7	4	4	2	3	2
External Stakeholders	8	1	7	8	0	5	5	3
Total	9	2	14	12	4	7	8	5

In each breakout room stakeholders discussed the following three discussion prompts:

1) What are your key issues or needs (in terms of solutions)?
2) Out of the 6 solutions presented in the workshop, which ones do you find most appealing and why? If none, what solution do you have in mind?
3) How do you see us working together to implement the solution of your interest and what is your plan to engage with farmers and other stakeholders in the project?

The breakout room discussions are summarized in Table 4.

Table 4: Breakout room results

Breakout Room	Key issues or needs	Most appealing solutions	Collaboration and engagement
International (EN)	• Problems differ depending on the case study site e.g. while in some case studies there is a lack of water, Nordic countries struggle with draining excess water from fields • Usability of the end product is critical	• WATERAGRI solutions seem to largely cover the needs of stakeholders • Need to look into combination of solutions and interconnectivity between solutions depending on the case study site • Modelling-based solutions can be combined with physical interventions such as wetlands	• Two-way dialogue between researchers and the farming community is critical for success • Critical to incorporate local knowledge and context into the models • Researchers need to be more proactive in approaching the farmers. • While initiating these interactions, timing should be taken into consideration e.g. it is difficult to engage farmers during the sowing or harvesting season
Finnish (FL)	• Farming benefits should be more in focus, some solutions costly • Solution should consider water management in an integrated way at farm and catchment scale with consideration to national/regional aspects (e.g., forests, soils, hydrology) • Data management issues and framework scale	• Remote sensing pipeline is very interesting, use of monitoring and satellite data and information management • Improved water balances and management in general is important, solutions needed for drainage & Irrigation(water) and nutrient management	• Sharing ideas and project info important in general for learning and development • Sharing info in Finland important (the group decided to have a follow-up meeting series and start with controlled drainage, sub-irrigation)
German (DE)	1. Problems differ depending on the area: • in Seeland/Switzerland the main problem is waterlogging, water scarcity is only a problem during short periods in summer, when drainage and irrigation have to be optimally coordinated • in parts of Austria water scarcity is an issue, increasingly long dry periods, the groundwater level drops, drought and heavy rainfall events (but even medium rain events can cause problems) – difficulty to keep soil on the field, farmers are increasingly looking for irrigation to cover gaps in precipitation, soil erosion due to compaction of the land and low infiltration	• Soil water retainers • Farmers interested in forecasting: Real-time modelling, Real-time-water-demand, Remote sensing • Using data for irrigation and nutrition management	• Must be well communicated what the project specifically brings to the farmers in the region. • Personal contact with farmers is important and should be the preferred way of communicating as soon as it is possible - online format is not ideal to reach out to farmer • Scientific support for farmers: accompaniment and decision aid

	• in Germany also increasingly dry summer, water scarcity increases, farmers deal with the question if it is worth investing in irrigation 2. Improve retention capacities and focus on nitrate inputs, nitrate pollution in groundwater is a topic, farmers have to deal with – pressure from EU, EU Water Framework Directive - how to reach good groundwater quality 3. How to solve several problems at once like improving water system in the soil and simultaneously building humus and CO_2 storage		
Polish (PL)	• Encourage farmers to use new solutions in face-to face meetings and discussion in native language. • Need for incentives (subsidies) to support implementation of the innovative solutions in agriculture.	• Promising solutions are Remote sensing pipeline, constructed wetlands, water retainer – not expensive, easy to apply, fast effects. • New innovation – automatization of field work (robotics) – in Poland Agribot for spraying pesticides	• Video conferencing is not effective in reaching farmers, direct contact with farmers in native language – local workshops and other events – to show effects of proposed innovations. • 2- If one farmer is convinced and has positive results it is easier to involve more followers.
Italian (IT)	• We are facing water scarcity since decades and there are already many solutions implemented since long time, to better combine the impacts and the trade-offs is the main issue right now • Adapt to both climate change and new EU policies. The overlapping impacts of both are expected to cause unknown effects on the food production chain and on the Made in Italy agri-food industry • Reconcile agriculture excellence with sustainable management of the agro-ecosystem. • Secure access to water to farmers • Restore soil fertility • Ecosystem services payment to farmers	• Some solutions are applicable only at irrigation district level (collective management) or will not offer economic benefits justifying the investments and operational costs • Nature Based Solution can be of interest when designed to be multipurpose and not just in favor of the environment putting costs in charge to the farmers	• Demonstration of effectiveness and impacts, beside a risk analysis, are required to convince farmers and decision makers
French (FR)	• Water quality: main issues for the French stakeholders are pollution by nitrates, pesticides, and micro pollutants	• The test of a combination of solutions would be interested for several stakeholders of the group: farm constructed wetlands mixed with	• How to share our different results about the solutions efficiency on water quality? (Water retainer, biochar, farm constructed wetlands…)

	• Working at field level, and downstream after the fields (in superficial water, a subterranean water)	drainage system (biochar) technology. There is a need for integration of solutions in order to solve problems of pollution of water by herbicides. • Use of remote sensing could be useful to manage the action plans of the catchment area, but it must be adapted to territory level management. • Water retainer will be experimented by a farmer of Yonne region	• How to work at territory scale, at farm scale and at field scale? • What technologies are useful for global governance of territories?
Hungarian (HU)	• "Common and clear" legislative background – harmonization on EU level for products AND services • new EU directives on agricultural product utilization (chemicals, etc.) – let's get ready to implement them, get prepared for those • responsibility of product distributors from non-EU countries (quality control burden on authorities) • business model background and cost benefit analysis specifically to any new product/service (SOLUTIONS)	• WATER RETAINER PRODUCT: in arid regions • FARM CONSTRUCTED WETLAND: in areas where excess water occurs	• There is a need for evidence-based examples in order to apply any solutions with the support of decision makers (governments) and also to be desirable from the aspect of farmers • In Hungary, now, there is a "lucky" era for new solutions, frameworks, funding models, ideas & thoughts, which can be partly provided e.g., by WATERAGRI, since these years new, Common Agricultural Policy has been forming.
Swedish (SE)	• Urgent need for incentives (subsidies) to constructions of water reservoirs as well as guidance and knowledge to the people using the irrigation • Sensors in the fields as supporting tools can become highly efficient.	• Promising solutions are Constructed wetlands, Precision farming, Water retainer – and Bio Char.	

4.2 Breakout room results

As shown in Table 4, the discussions of each breakout room were summarized by the breakout room rapporteurs. The analysis of answers to each discussion prompt is presented in this section.

4.2.1 Key issues and needs

The answers to Discussion prompt 1: key issues and needs can be further categorized according to the issues addressed. Three categories have been identified:

1. **Strategic**: issues related to policy, climate changes, or strategic decisions like giving priority to irrigation or drainage.
2. **Technical**: answers referring to technical problems
3. **Economic**: answers addressing economic problems and concerns

Table 5 shows the range of issues mentioned in each category.

Table 5: Issues and needs mentioned in the strategic, technical, and economic categories

Strategic	• Identify the target: irrigation vs drainage, or both • Allowing adaptation to Climate Change and EU policies • Increase water storage in wetlands, basins, or into the soil • Enhance water quality • Create an enabling legislative background
Technical	• Usability, accessibility, user friendly, data availability, and management • Capability to integrate into the existing crop husbandry/farm management/environmental context • Guidance for Irrigation (North EU) • Interacting with robotics
Economic	• Costs and benefits indicated • Economic support, ecosystem services payment, business opportunities

The distribution of the answers into the three categories (see Figure 6) shows a prevalence of concerns about the strategic issues, understandable in a transition phase toward the enforcement of the Farm to Fork strategy (European Commission, n.d.) in the context of Climate Change. Strategic aspects are typically a concern for decision-makers. Technical issues are usually the first stakeholders' concern, equally ranked than economic issues, which are the practical problems entrepreneurs would clarify when discussing hard & soft solutions to be implemented in their business.

However, the limited number of stakeholders, the uneven geographical distribution, and the prevalence of decision-makers, internal stakeholders, and institutions with respect to farmers biased the analysis.

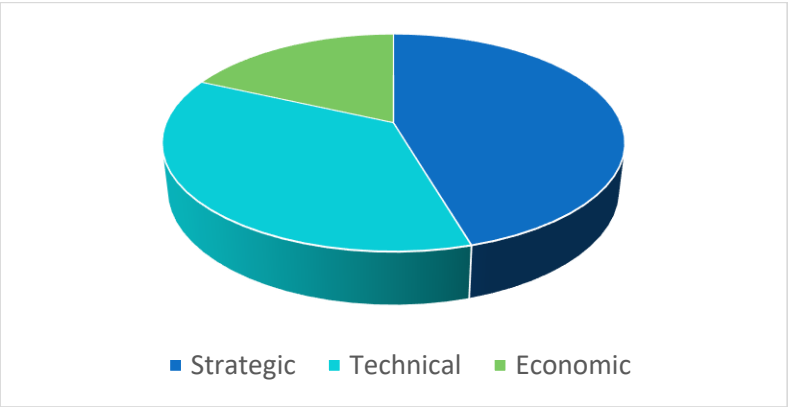


Figure 6: Distribution of strategic, technical, and economic concerns

4.2.2 Most appealing solutions

The distribution of responses to Discussion prompt 2: Wateragri solutions' appeal is shown in Figure 7. As expected, the higher-ranked solutions are those that are more familiar to the stakeholders and/or have a higher technology readiness level (TRL). The Wateragri Framework concept appears to have been understood and appreciated, being one of the most appealing solutions among those proposed.

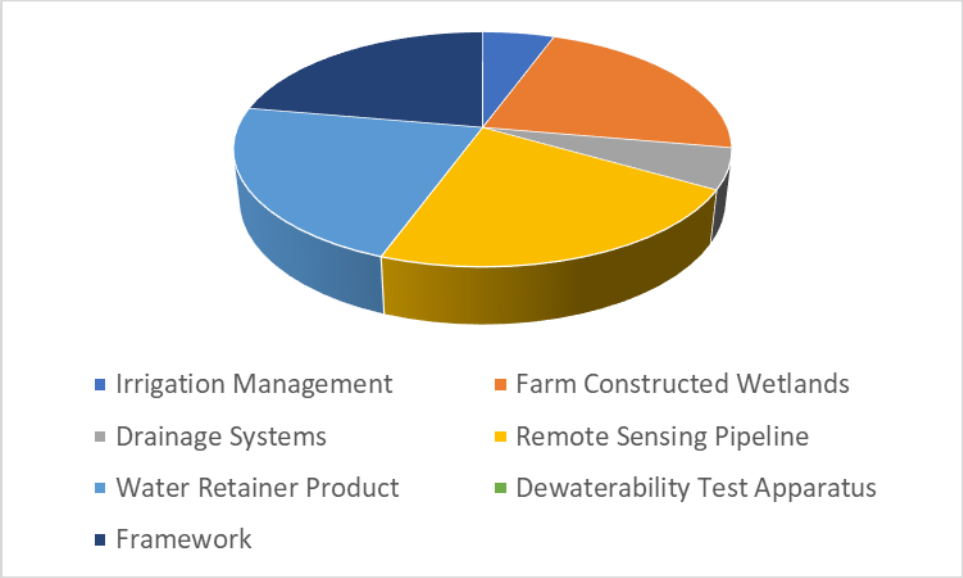


Figure 7: Appeal of WATERAGRI solutions to WS2 participants

4.2.3 Collaboration

The responses to discussion prompt 3: collaboration and engagement can be categorized into three categories:

1. **Participation**: willingness/need to be involved in the solution development or decisional processes.
2. **Communication**: answers referring to communication problems
3. **Support**: requests/needs of support

Table 6: Responses mentioned in participation, communication, and support categories

Participation	• Dialogue with farmers and policy makers • Stimulate participation of local "leaders" providing examples to the local community • Engage stakeholders at all levels, from farmer to districts/territories managers
Communication	• Knowledge providers must be more proactive approaching farmers/users • Communicate benefits at the local scale • Minimize the use of videoconferences favoring local workshops, demonstrations, open days • Communicate proved and replicable impacts
Support	• Provide robust scientific support

4.2.4 Take-Home messages

The messages from the breakout room discussions were summarised during the plenary closing session. The take-home messages are as follows:

1) There are still doubts about the suitability of investments (irrigation or drainage?) for their specific situation
2) The stakeholders are asking to know what the value for money of the proposed solutions is
3) Impacts need to be proven, and the benefits must be sensible in a short-medium period
4) Participation, at the local level and in the local language, showing robust evidence of applicability and benefits is necessary for knowledge transfer and persuasion
5) Support to be prepared dealing with the forthcoming EU policy changes and climate change adaptation strategy
6) More integrated and customized solutions, interacting and integrating with the farmers cropping systems and business

4.3 Feedback on the WATERAGRI Framework

No suggestions concerning the framework per se were brought up in WS2. However, a range of points emerged that need to be considered for future development and implementation of the framework:

- The framework needs to be user-friendly and tailored to the stakeholders. This is highly relevant for the implementation of the web-based platform, and especially for the communication of modeling results.
- The interaction between the stakeholders and the solution providers needs to become more direct at this stage of the project. More specific feedback on the development of the framework will emerge through a closer interaction. It is thus important for the solution providers to increase the communication with the stakeholders. The developers

of the framework should be included in these exchanges. If required, the framework developers will attend the meetings between the solution providers and the stakeholders.

The stakeholders are considering the extra cost of providing the required data to parametrize the models. While for some models the data can be obtained easily, other solutions require the installation, management, and maintenance of costly observation infrastructure. This important point must be discussed with stakeholders and the cost for implementation needs to include the cost of the required infrastructure to avoid the hidden cost.

5 Conclusion

5.1 Summary of key messages

Despite the COVID-19 pandemic, the WATERAGRI workshop 2 was conducted successfully with a turnout of 72 participants. Interesting and insightful discussions ensued with the external stakeholders in the breakout rooms where they shared their key issues and needs from WATERAGRI solutions, their preferences for solutions, and potential ways of working together to implement the solutions they prefer.

Participants highlighted concerns related to strategic decisions given change in climate and EU policies and concerns about the cost of WATERAGRI solutions and related business opportunities. Most stakeholders found solutions such as the remote sensing pipeline, irrigation management, and farm-constructed wetlands appealing for addressing their water management problems. Furthermore, breakout room discussions highlighted the need to create a dialogue with participants, proactively communicate with farmers, and provide them with robust scientific support.

Although stakeholders had a positive response to the WATERAGRI solutions, many aspects need to be addressed in the future. Stakeholders are interested to know the value for money of the proposed WATERAGRI solutions. Since the solutions are in the initial stages of development with exact cost structures unclear, this information is difficult to provide at this stage. However, solution providers should keep in mind that this question needs to be addressed in the upcoming workshops with the external stakeholders.

Stakeholders are further looking forward to the results and impacts of the proposed solutions and expect sensible benefits in a short to medium period. Furthermore, farmers expect customization in the proposed solutions so that they can interact and integrate with their cropping systems and businesses. Hence, attention should be given to keeping the solutions flexible and adjustable based on the farmer's needs to ensure that they provide the best results for the end-user. Furthermore, farmers should be engaged at the local level and in the local language to continuously demonstrate evidence of applicability and benefits of the solutions and obtain feedback on the solutions while still in the development stage.

5.2 Lessons learnt

We believe the organization and execution of the workshop correspond well to the goals outlined in the initial proposal. However, several important lessons were learnt that need to be considered in the upcoming workshops:

- The workshop was very insightful in the sense that we identified potential for developing closer relationships with the stakeholders. At this moment in time, the stakeholders have identified the solutions that are most relevant to them. It does seem necessary to increase the direct communication channels between the solution providers and the stakeholders.
- The need for face-to-face interactions in local languages remains – a desire which was and is challenging to implement due to the contact restrictions enforced by different governments as a measure to reduce infection rates in the Corona Pandemic. Even though a lot of effort was invested to set up a meeting, an online meeting cannot replace direct contact.
- In addition, it became apparent that clarity of objectives of the workshops needs to be established at the consortium level to be able to better shape the agenda and delivery of the workshops.

Given the high risk that the COVID situation will not be fully resolved until the next scheduled workshop, options need to be discussed to modify the current strategy taking into account the COVID situation, and the fact that many stakeholders have a relatively clear image of what they want to explore further. Stakeholder engagement can probably be enhanced by direct interactions at the local level, to a higher degree as originally forecast by the project (pre-COVID).

5.3 Future work

WATERAGRI workshop 2 was successful in understanding the concerns and needs of stakeholders pertaining to the WATERAGRI solutions, their preferences for solutions, and preferred ways of future collaboration. Based on the stakeholder's feedback and the lessons learnt, it is evident that future work should focus on strengthening the dialogue between solution providers and the farming community. This will ensure mutual benefits as farmers will be able to gain knowledge on the benefits of the proposed technologies while researchers will be able to incorporate local knowledge and context into their technical solutions.

Furthermore, the feedback received from workshop attendees clearly expresses the need to initiate direct contact with farmers in their native language. Video conferencing in English is not an effective medium to engage local farmers. Hence, the WATERAGRI stakeholder management strategy should be re-discussed to maintain and further develop the existing ties with stakeholders. New ways of engagement are required to engage farmers while still adhering to the restrictions imposed by the COVID-19 pandemic. Few future recommendations for upcoming workshops include:

- reduction of the use of English and avoidance when engaging with farmers,
- careful selection of stakeholders attending the multi-regional workshop (looking for champions or collective management body representatives),

- conducting a series of local workshops in the lead-up to the multi-regional workshop focusing on specific needs while maintaining the view of the overall workshop goal,
- connection with field and on-site visits to better grasp the reality and foster collective knowledge generation and sharing, and
- step-up and create sustained three-way engagement between solution providers, case study leads, and those directly impacted by the intervention (often farmers).

6 References

European Commission. (n.d.). Farm to Fork Strategy. Retrieved April 26, 2021, from https://ec.europa.eu/food/farm2fork_en

Mittal, A., & Dahal, B. (2020). *D1.4 Workshop 1 Report*. European Commission. Retrieved from https://wateragri.eu/wp-content/uploads/2020/11/WATERAGRI-D1.4-Workshop-1-report-PU-FV.pdf

7 Appendix

7.1 Solution Interest Survey

Interest in WATERAGRI solutions

Dear all,

We welcome you to join the WATERAGRI workshop on 25th March. To make the workshop interesting and relevant for you, we would like to know which WATERAGRI solutions you would like to hear more about. Please fill in this short survey to indicate your preferences.

All data and information will be collected, stored, and processed according to the European General Data Protection Regulation (GDPR). If you have any questions or queries please contact the WATERAGRI project team through https://wateragri.eu/. We thank you for your kind collaboration.

* Required

WATERAGRI

Name *

Your answer

Professional email address *

Your answer

Organization *

Your answer

Which country are you from? *

Your answer

Which type of stakeholder do you represent? *

- ◯ Policy makers at local level/munipalities
- ◯ Water management organization
- ◯ Agricultural chambers
- ◯ Farmers or farm managers
- ◯ Media
- ◯ Researchers/Universities
- ◯ Non governmental organization
- ◯ Industry
- ◯ Other:

WATERAGRI project will develop the following solutions in the coming years. Which solutions are you interested in and would like to hear more about during the workshop on 25th March? *

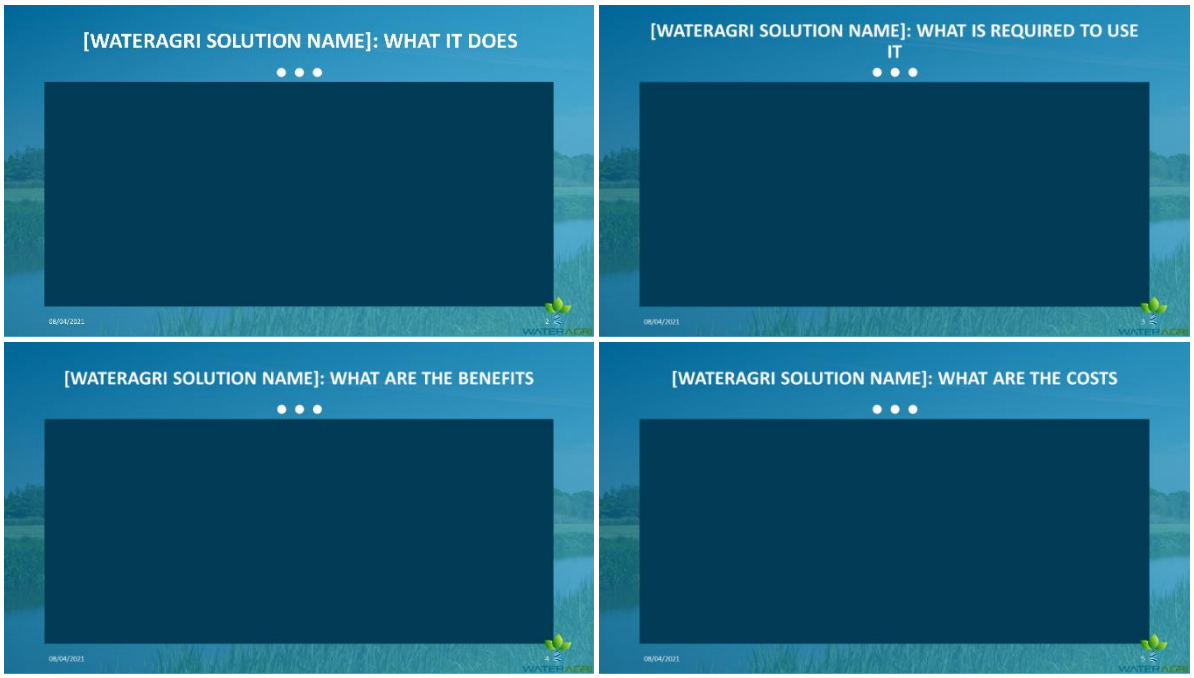
- [ ] Farm constructed wetlands for water and nutrient retention
- [ ] Remote sensing pipeline
- [ ] Irrigation management and agrometeorological monitoring solutions
- [ ] Precision irrigation system
- [ ] Water retainer product
- [ ] Biochar for water retention
- [ ] Tracer methods
- [ ] Dewaterability estimation test apparatus
- [ ] Drainage systems
- [ ] Bio-based nutrient-collecting membranes
- [ ] Biochar adsorbents for nutrient uptake
- [ ] Microfluidics

Do you grant permission to the WATERAGRI project to store your personal information (name, email, and organization) to contact you for relevant workshops in the future? *

- ( ) Yes
- ( ) No

Submit

7.2 Presentation template for solution providers



7.3 List of invitees and participants

7.3.1 List of Invitees

The list of invitees by breakout rooms is as follows. Please note that along with external stakeholders, all the project partners were also invited.

Last Name of Stakeholder (IT)	**First Name of Stakeholder**	**Organization**
Vitali	Patrizia	Arpae
Magrini	Sarah	Coldiretti
Moroni	Fernanda	Autorità di bacino distrettuale del fiume Po
Caporossi	Emilio	Hera
Deserti	Marco	Regione Emilia Romagna
Toscano	Attilio	Università di Bologna (Ministry of Infrastructures)
Ghetti	Alessandro	ANBI ER
Solmi	Michele	Consorzio di Bonifica Renana
Canovi	Loris	IREN
Costa	Massimiliano	Comune di Ravenna
Tonelli	Framcesco	Consorzio di Bonifica Burana
Gardella	Marco	
Montercorboli	Chiara	Autorità di bacino distrettuale del fiume Po
Pellegrino	Immacolata	Regione Emilia Romagna
Cimatti	Emmanuele	Regione Emilia Romagna
Last Name of Stakeholder (FL)	**First Name of Stakeholder**	**Organization**
Aijo	Helena	
Rahkila	Riina	
Khaira	Jhang	Govt. High School Kot

Last Name of Stakeholder (DE)	First Name of Stakeholder	Organization
Schmidt	Marius	Forschungszentru Julich GmbH
Fichtner	Reinhold	Landwirtschaftskammer Nordrhein-Westfalen
Etter	Jakob	Grossrat Kt. Bern & Mitglied Pro Agricultura Seeland
Freund	Martin	Standortleiter Inforama Seeland & Gemeinderat Ins
Ith	Markus	Geschäftsführer Zukunft Dre Seen Land
Landolf	Bruno	Gemeinderat Epsach
Reinhard	Kaspar	Gemeindeverband Seeland Biel/Bienne
Sydler	Pierre-Alain	Stiftung Biotopverbund Seeland
Kormann	Iris	Pro Agricultura Seeland
Tschachtli	Adrian	Wasserversorgung Grosses Moos
Schmocker-Fackel	Petra	Bundesamt für Umwelt (BAFU)
Hubmann	Richard	Organic Farm Owner
Kochauf	Martin	Organic Farmer
Wumbauer	Sepp	Styrian Farmers' Association
Prosenbauer	Manfred	Chamber of Agriculture Upper Austria energy and climate
Uhl	Peter	District of Weiz South
Kastelliz	Arno	Farmer school Obersiebenbrunn
Weigl	Karl	Neighbour farmer of case study in Austria
Wagner	Thomas	Neighbour farmer of case study in Austria
Muhr	Thomas	Neighbour farmer of case study in Austria
Lahrssen	Julian	BOKU
Last Name of Stakeholder (HU)	**First Name of Stakeholder**	**Organization**
Bozán	Csaba	National Agricultural Research and Innovation Centre, Research Institute of Irrigation and Water Management
Oncsik	Mária	Hungarian Irrigation Association
Csaba	Csaba	T-Markt Ltd.
Kövesdi	Ádám	MAGTÁR Ltd.
Harangi	Csaba	Hungarian Water Treatment Cluster
Sinka	Attila	Hungarian Water Association (HWA, in Hun.: MASZESZ)
Pravetz	Tamás	Central-Tisza-Region Water Management Directorate (KÖTIVIZIG)
Rózsa	Helga	Central-Tisza-Region Water Management Directorate (KÖTIVIZIG)
Kis	András	Regional Centre for Energy Policy Research (REKK)
Kurdi	Viktor	Hungarian Water Utility Association (MaVíz)
Nagy	Edit	Hungarian Water Utility Association (MaVíz)
Rátfai	György	Tisza Office
Fitrzyk	Magdalena	
Last Name of Stakeholder (PL)	**First Name of Stakeholder**	**Organization**
Ambryszewska	Katarzyna	Centrum Doradztwa Rolniczego w Brwinowie
Zarudzki	Ryszard	Kujawsko-Pomorski Osrodek Doradtztwa Rolniczego w Minikowie
Kopera	Tomasz	Lodzki Osrodek Doradztwa z siebdziba w Bratosewicach
Orzedowski	Wieslaw	Lubelski Osrodek Doradtzwa Rolniczego w Konskowoli

Tarnacki	Marek	Dolnośląski Ośrodek Doradztwa Rolniczego we Wrocławiu
Baryłko	Marek	Dolnośląski Związek Dzierżawców i Wlaścicieli Nieruchomości Rolnych we Wrocławiu
Puciłowski	Józef	Gospodarstwo Rolne Lubnów Józef Puciłowski
Olejnik	Mariusz	Federacja Związków Pracodawców-Dzierżawców i Właścicieli Rolnych
Adynkiewicz - Piragas	Mariusz	Environemtal Rersearch Department Wrocław
Ligenza	Przemysław	Instytut Meteorologii i Gospodarki Wodnej Państwowy Instytut Badawczy
Daca	Przemysław	Krajowy Zarząd Gospodarki Wodnej w Warszawie
Przybylski	Mariusz	Regionalny Zarząd Gospodarki Wodnej we Wrocławiu
Szmulewicz	Wiktor	Krajowa Rada Izb Rolniczych
Verset	Małgorzata	Krajowa Rada Izb Rolniczych - Biuro w Brukseli
Salińska	Magdalena	Agencja Restrukturyzacji i Modernizacji Rolnictwa, Oddział dolnośląski
Kulaszka	Waldemar	Wojewódzki Inspektorat Ochrony Środowiska we Wrocławiu
Felińska	Małgorzata	Przedsiębiorca rolny
Jemioła	Jacek	Dolnośląski Urząd Wojewódzki Wydział Nieruchomości, Rolnictwa i Środowiska
Dyba	Iwona	farmer.pl
		Ministerstwo Rolnictwa i Rozwoju Wsi
Last Name of Stakeholder (SE)	**First Name of Stakeholder**	**Organization**
Dyrlund Martinsson	Ulrika	HIR - Hushållningssällskapet
Hjelm	Emma	Jordbruksverket
Svensson	Sven-Erik	SLU - Alnarp (Agriculture University)
von Arnold	Carl-Adam	Jordberga
Bonthron	Christoffer	Jordberga
Willert	Marcus	HIR - Hushållningssällskapet
Kallsäby	Martin	GN - Gårdstånga Nygård
Sylwan	Peter	KSLA - Royal Association of Agriculture and Forestry
Wikström	Lennart	KSLA - and various Agriculture magazines
Ramel	Marianne	DLA Piper
Johansson	Jonas	Eslövs kommun
Alström	Tette	Ekologigruppen
Bernhoff	Sven-Olof	Skånefrö
Last Name of Stakeholder (FR)	**First Name of Stakeholder**	**Organization**
Paravano	Laurette	Agricultural Chamber of Yonne
Lalu	Robin	Agricultural Chamber of Yonne
Renoux	Guillaume	Leader of the farmers into the territory
Leprun	Benoit	Leader of the farmers into another territory
Ferrané	Claudine	Biodiversity French Agency INRAE
JUAN	Guillaume	Biodiversity French Agency INRAE
Ghlouci	Hana	SERPN Water Union
Ratiarson	Jérôme	Seine Normandie Water Agency
Durandeau-Laffargue	Sophie	Agence de l'eau Seine Normandie

7.3.2 List of Participants

The list of participants admitted to the MS TEAMS meeting is as follows:

NAME	ORGANIZATION
Aashna Mittal	TUDelft
Adriano Battilani	CER
Akos, Koos	BZN
Alba Canet	BOKU
Albert Bernsteiner	
Anna Biebl	ALCN
Arnold Mona	VTT
Attilio Toscano	UniBO
Bishal Dahal	OULU
Björn Klöve	UniOulu
Bódi Erika	UniDEB
Bogusław Kiedrowski	
Cimatti Emanuele	Regione Emilia Romagna
Clara Kupelwieser	
Dadebo Derrick	Egypt Japan University of science and Technology
David Andersson	ECOERA & Skånefrö
Davide Rondini	Consorzio Bonifica Renana
Diego Guidotti	Agricolus
Dijana Stefanovic	InoSens
Durandeau Sophie	AESN
Edoardo Desiderio	
Emma Hjelm	Jordbruksverket
Eva Strenge	
Ewa Knap	UP
Felix Witing	
Fereshteh Pourazari	RISE, Sweden
Flavia Hotts	
Francesco Tonelli	Consorzio Burana
Fribourg-blanc	OIEau
Gioele Chiari	CER
Gustaf Ramel	Gårdstånga Nygård
György Rátfai	Tisza Office
Haidi Abdullah	VULTUS
Hana Ghlouci Mazeron	SERPN Water Union
Harrie-Jan Hendricks-Franssen	FZJ, Germany
Helena Äijö	salaojayhdistys
Hong Nguyen	
Houssem Eddine HAROUN	Ciheam, Setif
Ines Kantauer	BOKU
Ingrid Nesheim	
Iris Kormann	Pro Agricultura Seeland
Jergus Semko	
Joanna Tukasik	

Johanna Ecklmayr	
Justyna Karolak	WODR
Kajári Balázs	
Kedar Ghag	OULU
Kedrala Wabela	
Kerezsi György	
Khakalo Alexey	
Kinga Veghelyi	
Köröspartí János	
Laura García Herrero	
Laurette Paravano	Agricultural Chamber of Yonne
Luca Demarchi	
Magdalena Fitrzyk	
Małgorzata Ramatowska	KRIR
Marcin Kalisz	
Marco GARDELLA	
Marian Wojnicki	
Marius Schmidt	Forschungszentru Julich GmbH
Martin Regelsberger	TBKR
Michal Kotarski	
Miklas Scholz	Ulund
Milana Sekulić	InoSens
Nora, Hatvani	BZN
Norbert Túri	
Oliver S. Schilling	UniNE
Oliwier Gawroński	
Paweł Sender	
Pellegrino Immacolata	
Philip Brunner	UniNE
Piotr Dąbrowski	
Reiter Adam	
Richard Hubmann	
Riina Rahkila	ProAgria Oulu, Finland
Rózsa Helga	
Sabrina Grüner	
Sarah Magrini	Coldiretti ER
Sebastian Puculek	ULund
Sedioli Olga	
Stefano Anconelli	CER
Suhad Almuktar	ULund
Sven-Erik Svensson	
Syed Mustafa	OULU
Tamara Avellán	UniOulu
Tamás Szolnoky	AGROGEO
Tayyaba Sohail	US-PCAS Water, Pakistan
Tomasz Kuczyński	
Tymoteusz Bolewski	
Vattay Richard	BZN

Vladimir Mrkajic	InoSens
Wiesław Fiałkiewicz	UPWr
Yirong Leng	
Yu Wang	
Zbigniew Staszewski	
Zoran Kapelan	TUDelft

7.4 Invitation (First) Letter

08 Apr. 21

Invitation to the 2nd WATERAGRI Consultation Workshop –
Early engagement workshop

Esteemed Colleague,

We herewith cordially invite you to the 2nd WATERAGRI Consultation Workshop on **25 March 2021**.

WATERAGRI project aims to re-introduce and enhance **sustainable solutions for water retention** and **nutrient recycling** developing **traditional drainage and irrigation solutions** and **re-introduce nature-based solutions** such as integrated constructed wetlands, bio-inspired drainage systems and sustainable flood retention basins in the agricultural landscape, leading to **better retention of both water and nutrients**.

WATERAGRI aims to enable more sustainable agricultural production in view of the application of the Farm to Fork and the new CAP 2021-2027 and of the EU long term sustainability targets.

A portfolio of solutions is tested in ten case studies distributed across three climatic zones in Europe.

The **overarching goal** of this workshop **is to enhance the dialogue between solution providers and the stakeholders**, giving to all of you the **opportunity to interact with the developers of the novel technologies and solutions** composing the WATERAGRI portfolio.

Also, **the overall framework of the WATERAGRI project will also be presented** and there will be time for questions and ample opportunities to provide feedback.

We kindly ask you to sign up and fill in the information required in the following form until the end of this month:

https://forms.gle/tVnz1AjdXp4sJW1Y8

The workshop will be virtual, or when and where possible phygital. The central meeting will be virtually hosted by Consorzio di Bonifica - CER in Bologna, Italy, whilst allowing for physical meetings at the local case study locations where permitted.

The agenda is structured in a manner as to allow for information sharing in a virtual plenary session and for break-out discussions by case study location.

Please, fill the registration form indicating what are the solutions you deems more appropriate and effective for your context, we want shape the workshop agenda on your very interests and efficiently organise the breakout session.

In case you want to know more about the solutions, please consult the recorded presentations from the last workshop. The links are provided below:

1. **WATERAGRI project overview presentation by Miklas Scholz:** https://youtu.be/B00tG_MHtYM

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 858735.

2. **Presentations by solution providers:**

- **Water decision support system by AGRICOLUS: https://youtu.be/INXIb8f1fFA**
- **Biochar for water retention by Alchemia Nova (ALCN): https://youtu.be/6LtD0pbzEkc**
- **Water retainer product by Bay Zoltan Non-profit Ltd. (BZN): https://youtu.be/deYYM59qUwc**
- **Microfluidics by EDEN Tech: https://youtu.be/wsID5CxsMio**
- **Farm constructed wetlands by Lund University (ULUND): https://youtu.be/TpemgfRuCaE**
- **Dewaterability estimation test apparatus by University of Salford (USAL): https://youtu.be/h2TxSo3v6D0**
- **Bio-based nutrient collecting membranes by VTT Technical Research Centre of Finland Ltd (VTT): https://youtu.be/reKEXsD1IXU**
- **Remote sensing pipeline by Vultus AB (VULTUS): https://youtu.be/_A8gKIDvi5o**

Farming Community Engagement by Adriano Battilani: https://youtu.be/so-2pLY4_M4

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Looking forward to meet you,

On behalf of the WATERAGRI Team, kind regards

Adriano Battilani

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 858735.

Annex: Tentative Workshop Agenda

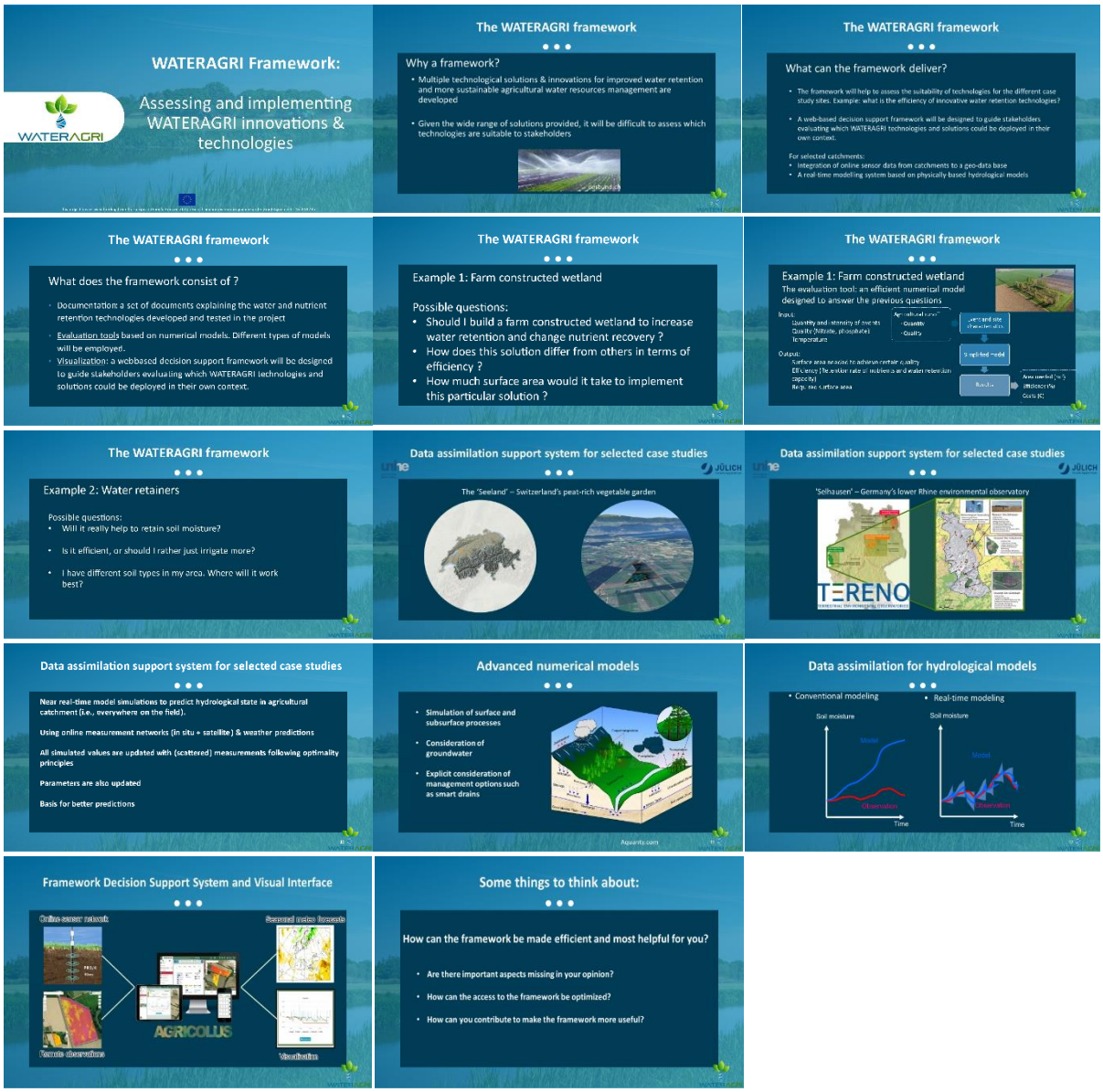
Time	Topic	Responsible/Speaker
9:30- 9:45	Welcome and Introduction to the workshop	ULUND/CER
9:45-10:00	Framework (A1) in combination with modelling (A2)	UNINE
10:00-10:30	Plenary Q&A about framework	UNINE
10:30-10:45	Introduction to framework solutions	CER
10:45-11:15	Presentations of selected solutions	Solution providers
11:15-11:30	Comfort Break	-
11:30-12:00	Presentations of selected solutions	Solution providers
12:00-13:00	Breakdown sections (discussion about framework solutions)	Moderators tbd
13:00.13:30	Feedback from sections, Wrap up	CER

The final version of the meeting agenda and the link to the meeting will be sent in a successive message.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 858735.

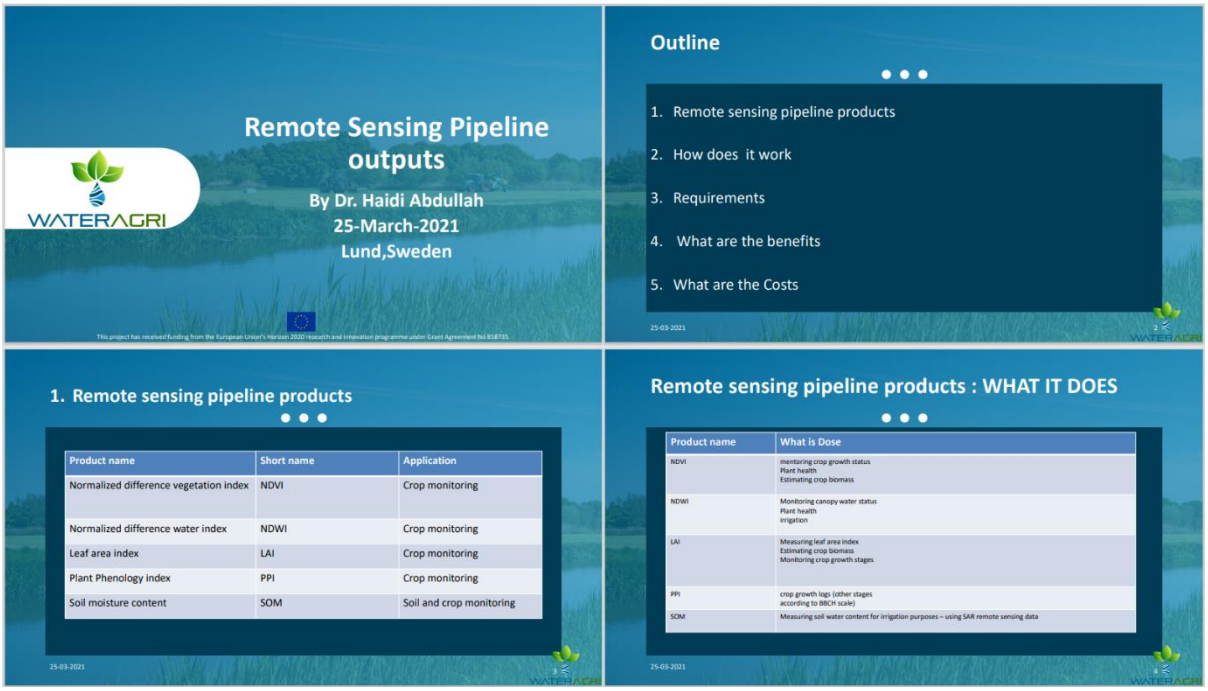
7.5 Presentations

P1 - WATERAGRI Framework: Assessing and implementing WATERAGRI innovations & technologies (P. Brunner, UniNE).



P2 - Introduction to framework solutions. (A. Battilani, UniNE).

P3 – P8 – Six selected WATERAGRI Solutions.



Remote sensing pipeline : WHAT IS REQUIRED TO USE IT

Remote sensing pipeline products : WHAT ARE THE BENEFITS

- Easily measure the impact of your decisions on your fields: check crop health at any stage of the season and measure impact of variables like weather and irrigation.
- Real-time monitoring with your farm and quick response for taking actions. Once the satellite observation is available, we are able to process the dataset and give you the analysis in time.
- Cover the whole growing season, no gaps. We are able to provide your service with all-year dataset.
- Global coverage, more frequently in Europe (sentinel 2 based NDWI product, 1-3 days revisiting time)

Remote sensing pipeline : WHAT ARE THE COSTS

Costs to deliver relate to:
1- Image acquisition
2- Data processing
3- Data transfer
4- Cloud storage.

Costs scale with requests and hectares.

Delivery of all monitoring services costs ~0.2€/hectare/year considering average field of 10 hectares and weekly monitoring.

Further economies of scale can make the costs much lower.

THANK YOU!

WATERAGRI

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 858735

Farm Constructed Wetland (FCW):

Water treatment and retention as well as nutrient recovery solution

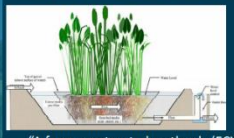
Suhad Almuktar, Linus Zhang and Miklas Scholz (ULUND), and
Alba Canet-Marti (BOKU)

Lund, 25 March 2021

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 858735

1. FCW: WHAT IT DOES I/II

Coupling of constructed wetland with farming wastewater:



&

"A farm constructed wetlands (FCW) is defined as an ecologically engineered system comprising a series of shallow free surface flow constructed wetland cells containing emergent vegetation, which is designed to receive and treat farmyard runoff." Scholz et al. (2007).

1. FCW: WHAT IT DOES II/II

- Farm wastewater (e.g., yard/field runoff, silo, diary and piggery) treatment
- Dynamic and combined water purification (overland, horizontal and vertical)
- Nutrient recycling via effluent reuse benefiting crops (Almuktar et al, 2018)
- Water storage for irrigation/flood control
- Habitat creation and ecosystem restoration
- Improved drainage of effluent with less solids
- Increase of local air moisture
- Cost-savings through design optimization

2. FCW: WHAT IS REQUIRED TO USE IT

- Incentives from all stakeholders: (farmer, local authority and policy support)
- Land (0.5–5% farm area for FCW) and farm wastewater
- Deeper inflow section (1–2 m deep) for sedimentation
- Vegetated zone (0.1–0.5 m deep)
- Volume = 1,500 –3,000 m^3
- Meanders to increase retention time
- Natural sealing layer with clay soil
- Initial investment for implementation
- Long-term plan for sustainability
- FCW guide book (Carty et al., 2008)

3. FCW: WHAT ARE THE BENEFITS

- High level of treatment and robustness: Efficient treatment of phosphorus, nitrogen, biochemical oxygen demand, suspended solids, hydrocarbons and pathogens
- Nutrients recycling for increased yield and decreased fertilizer application
- Low cost farm wastewater treatment and simple operation
- Habitat and biodiversity enhancement
- Improved drainage of effluent
- Sediment capture
- Improved micro-climate
- Reduced water use during draughts
- Runoff and flood management
- Odour minimization
- Aesthetically pleasing

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4. FCW: WHAT ARE THE COSTS I/II

- The cost of FCW wastewater treatment facilities comprise capital and operation costs.
- The capital costs refer to the cost of the land needed for the installation of the facility, the construction cost, and engineer and contractor fees.
- The FCW construction costs are comparable or lower than the costs for conventional biological wastewater treatment plants providing the same level of treatment.
- The operation costs, however, are much lower than those for conventional treatment plants.
- Monitoring costs are linked to research projects.

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4. FCW: WHAT ARE THE COSTS II/II

- Land use/purchase: Highly variable (average of € 3,000) depending on country
- Design and planning: Minimum € 1,000
- Construction: Variable (average of € 20,000)
- Installation, implementation and commissioning: Variable € 5,000)
- Running costs and maintenance: Minimum € 1,000 per annum
- Monitoring (optional): Minimum € 1,000 per annum
- Decommissioning: Usually not required
- FCW often become part of the landscape
- **Total:** € 30,000 – € 40,000 per small to medium-seized farm

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4. FCW: LINK TO THE WATERAGRI FRAMEWORK

- The WATERAGRI Framework (UNINE and FZJ input) will guide practitioners in selecting and designing FCW.
- (Simplified) models (BOKU input) describe the processes within FCW systems.
- Models are tools to compare two (or more) similar systems (options) and their behaviours under different conditions.
- Predicting the performances of a given FCW system.
- The framework answers "What if?" questions.
- Models perform FCW system controls.
- Meyer et al. (2015) reviewed wetland models.

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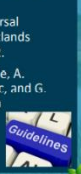
4. FCW: PRACTICAL REFERENCES AND GUIDELINES

- Almuktar, S.A., Abed, S.N. and Scholz, M., 2018. Wetlands for wastewater treatment and subsequent recycling of treated effluent: a review. *Environmental Science and Pollution Research* 25 (24), 23595-23623.
- Carty A., Scholz M., Heal K., Gouriveau F. and Mustafa A. 2008. The Universal Design, Operation and maintenance guidelines for Farm Constructed Wetlands (FCW) in temperate climates. *Bioresource Technology*, 99 (15), 6780-6792.
- Meyer, D., F. Chazarenc, D. Claveau-Mallet, U. Dittmer, N. Forquet, P. Molle, A. Morvannou, T. Palfy, A. Petitjean, A. Rizzo, R. S. Campa, M. Scholz, A. Soric, and G. Langergraber. 2015. Modelling constructed wetlands: Scopes and aims - a comparative review. *Ecological Engineering* 80, 205-213.
- Scholz, M., 2007. Classification methodology for sustainable flood retention basins. *Landscape and Urban Planning* 81, 246–256.



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WATERAGRI

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 858735.

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Agricolus Irrigation and Nutrition Management

Diego Guidotti
Agricolus

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 858735.

Agricolus Wateragri: WHAT IT DOES?

A set of digital solutions to support farmers in farm irrigation and nutrient management.

The system will be integrated with the Wateragri Framework to support farmers in evaluate all the Wateragri technologies

- water and nutrient balance
- spatial modelling of crop demands
- farm management information systems

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Agricolus Wateragri: WHAT IT DOES?

Farm irrigation and nutrient management

How much?
When?

Where?

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Agricolus Wateragri: WHAT IS REQUIRED TO USE IT

Sensors
At least 1 weather stations. Optionally soil sensors

Farm Data
Crops, management practices, irrigation systems, soil data, soil data

Models & Data
Remote Sensing data, weather based models, data analysis

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WATERAGRI

Agricolus Wateragri: WHAT ARE THE BENEFITS?

- Balance of nutrient (water + fertilizer) needs of field/crops
- DSS for optimizing nutrition management
- provide a good level of approximation of needs and risks with minimum available data
- Promote good (environmental and economical) irrigation and fertilization practises

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Agricolus Wateragri: WHAT ARE THE COSTS

Sensor

Depends on:
- use freely available weather data (if available)
- virtual weather stations (100-300 €/year)
- actual weather station (about 1000€/year maintenance included)

Data

Depends on:
- 10m resolutions data are basically free (a fee may be due for processing and analysis)
- higher resolution cost may vary

Software

The price are usually based to a yearly free per hectare

Costs may depends on total surface and average plot dimensions

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THANK YOU!

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Bio-inspired multi-layer drainage system

Anna Biebl
Ines Kantauer
25th March 2021

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 858735.

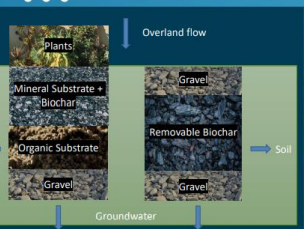
Bio-inspired multi-layer drainage system Captures nutrients and water from agricultural runoff

Filtration of **agricultural overland flow**

Retention of
- **Water**
- Agricultural **Chemicals**
- **Nutrients** from Fertilization

Nutrient uptake by plants

Increase of **Biodiversity** by plants



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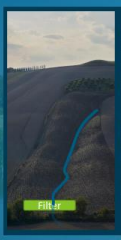
Bio-inspired multi-layer drainage system Requirements



Knowledge of site:
Soil type and profile – depth of filter
Climatic conditions
Occurrence and placement of overland flow
Dimensions of system to be determined to local conditions

Accessory work:
Excavation of ditch
Residues disposal - removable biochar filter; reuse as fertilizer
Plant harvest

The system is passive if is not constantly monitored as in the current development phase – no energy supply needed

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Bio-inspired multi-layer drainage system Current development

Installation of first prototype in Mistelbach, Austria spring 2021
- Characterisation of nutrient recovery by both systems
- Characterisation of water retention by both systems
- Characterisation of effluent water quality (safe for groundwater infiltration?)
- Evaluation of re-usability of biochar as fertilizer (adsorption / concentration of chemicals)

Evaluation of actual costs and benefits for the location in Mistelbach
-> Cost and benefits will differ depending on spatial factors soil, different climate scenarios etc.

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Bio-inspired multi-layer drainage system: Expected Benefits

Increase in agricultural productivity
- Increased water storage in the area around the filter and groundwater recharge
- Access to funding (e.g. "Umweltgerechte und biodiversitätsfördernde Bewirtschaftung (UBB") –ÖPUL 2015)
- Loaded biochar as fertilizer might improved crop growth and yield compared to fertilizer applied alone (e.g. Wali 2020) – no costs for loading char with artificial fertilizer
- CO_2 reduction by carbon storage in field with biochar

Increase in ecosystem health
- Biodiverse planting creates refuge and source of food for a variety of animals
- Decreased leaching of nutrients into surface waters and streams

-> reduced eutrophication, less loss of ecosystem services, no costly remediation (e.g. https://www.oecd.org/water/infographic-impacts-of-water-pollution.htm)

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Bio-inspired multi-layer drainage system Expected costs

For a system with 1 m x 1.5 m x 1 m (W x L x D)

System 1 with plant cover	Euros
Substrates	260
Plants	4
Foil	54
Drainage pipe	7
Transport	150
Machine and operator	215
TOTAL	€ 690

System 2 with removable biochar	Euros
Substrates	323
Foil	54
Biochar containment	15
Drainage pipe	7
Transport	150
Machine and operator	215
TOTAL	€ 764

Costs depend on: plant-choice, available machines at farm, necessary length of drainage pipe etc.

Loss of land for cultivation – 1,5m² per System → alternative use = crop production or simple biodiversity strip

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Water Retainer Product

WATERAGRI

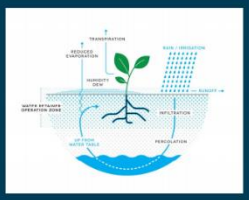
Richard Vattay (Water&Soil Ltd.)

25. 03. 2021

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 858735.

Water Retainer Product: WHAT IT DOES

- reduces evaporation loss of the soil and absorbs humidity from the air to the soil;
- water soluble liquid, which is applied by spraying onto the surface of the soil;
- organic based and degrades without any remedies within three months;
- can be used with repeated treatment;
- registered for use in organic farming



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Water Retainer Product: WHAT IS REQUIRED TO USE IT

- water suitable for agricultural spraying;
- any kind of sprayer, from a watering can to the most sophisticated sprayer equipment;
- soil well-prepared for seeding is preferred, fine-grained soil is ideal

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Water Retainer Product: WHAT ARE THE BENEFITS

- **better** germination
- longer resistance to drouth
- higher yield
- less soil compaction
- more sustainable agricultural production

Further benefits in irrigated cultivation:

- significant water saving: up to 30 – 50% of the irrigation water used
- healthier soil and less soil salinization due to less irrigation

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Water Retainer Product: WHAT ARE THE COSTS

- product end-user price: € 6.00 per liter
- dosage: 10 liter / hectare (1 ml/m²)
- application cost is irrelevant because it can be sprayed together with most of the pre-emergent herbicides
- treatment cost of 1 m² : € 0.006

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THANK YOU!

WATERAGRI

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WATERAGRI

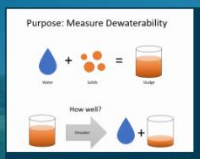
Dewaterability Estimation Test (DET) Apparatus

Suhad Almuktar, Linus Zhang and Miklas Scholz (ULUND)
Christian Clausner, Apostolos Antonacopoulos, Yirong Leng, Flavia Hotts, Miklas Scholz and Yu Wang (USAL)

Lund, 25 March 2021

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 858735.

1. DET APPARATUS: WHAT IT DOES



- The DET apparatus was developed at The University of Salford by Prof Miklas Scholz and his team.
- The goal of this test is to estimate the dewaterability of sludge being a mixture of water and solids.
- The novel device measures how well a sludge can be dewatered. This information can then be used to inform management decisions regarding the selection of dewatering technology and dewatering aids.
- As part of WATERAGRI, the test will also be assessed as a possible replacement for soil infiltrometers.

2. DET APPARATUS: WHAT IS REQUIRED TO USE IT

- The DET is designed to be portable. There is a carrying case for the device itself and all necessary supporting materials and consumables.
- Any standard Windows-based laptop will be able to power the device via an USB and to run the software.
- Because the measurements are impacted by the outside temperature, a temperature sensor has been added. This allows for normalization of data.

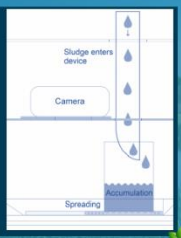
3. DET APPARATUS: WHAT ARE THE BENEFITS I/III

- DET competes well with the old CST parameter.
- WATERAGRI will further develop the DET apparatus to test how easy it is for different agricultural soils to take-up and loose water during rainfall or irrigation.
- We will explore, if the test can also be used to evaluate the water retention capacity of different soils in combination with biochar (BOKU) and the water retainer product (BZN).
- The data will also allow for better management decisions regarding the selection of dewatering technology and (chemical) aids for different types of sludge.

Variable	CST	DET
Range of Application	★☆☆	★★★
Simplicity	★★★	★★☆
Reliability	★☆☆	★★★
Measurement Time	★★☆	★★★
Flexibility	★☆☆	★★☆
Measurement Data	★☆☆	★★★

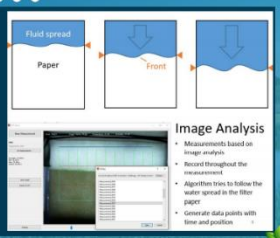
3. DET APPARATUS: WHAT ARE THE BENEFITS II/III

- The original target market for the DET technology was the water and wastewater industry.
- However, WATERGRI will allow for a wide application of the DET in agricultural water management, which is a field that offers a new market for the innovation.
- A numerical analysis of the water retention capacity of agricultural soils and sludge particularly during dry periods will be performed.
- USAL and LUND will develop methods to reduce the water loss properties of different soils using the DET apparatus.



3. DET APPARATUS: WHAT ARE THE BENEFITS III/III

- Attention will also be given to case studies with wetland soils and sediment.
- USAL will also further develop the current visualization capability of the DET apparatus, allowing for easier interpretation and comparison with previous data.
- The dewaterability characteristics of (Hungarian) fermented sludge to be used as an alternative water source for irrigation will also be assessed.



4. DET APPARATUS: WHAT ARE THE COSTS

- Currently only three DET prototypes (used for research purposes) exist.
- A prototype costs about € 2000 to 5000, depending on the place of manufacture.
- Annual running costs of the device are about € 200.
- The estimated sale price of the finalized DET product might be around € 3000.
- The assumed annual market for the DET device is about 20,000 items (€ 60M)
- A current patent held by USAL exists for the UK market only.
- International patent applications are pending.
- The inventors and USAL are looking out for an investor.
- ULUND and USAL are searching for more device applications.

4. DET APPARATUS: LINK TO THE WATERAGRI FRAMEWORK

- The WATERAGRI Framework will assist stakeholders in selecting the DET device for appropriate applications.
- The framework will help to assess the suitability of the DET device.
- The framework will provide DET documentation, DET evaluation tools, DET databases for case-based reasoning applications and supports the visualization of DET output files.
- DET documentation will provide details to stakeholders to make decisions regarding suitability, expected efficiency and local condition suitability.
- Real time DET visualization output will be modelled by framework users.
- The framework will provide a quality check on the validity of DET solution claims.

4. DET APPARATUS: PRACTICAL REFERENCES AND GUIDELINES

- Scholz M. (2005), Review of Recent Trends in Capillary Suction Time (CST) Dewaterability Testing Research. Industrial & Engineering Chemistry Research, 44 (22), 8157-8163.
- Sawalha O. and Scholz M. (2012), Impact of Temperature on Sludge Dewatering Properties Assessed by the Capillary Suction Time. Industrial & Engineering Chemistry Research, 51 (6), 2782-2788.
- Scholz M., Almuktar S., Clausner C. and Antonacopoulos A. (2019), Highlights of the Novel Dewaterability Estimation Test (DET) Device. Environmental Technology. DOI: 10.1080/09593330.2019.1575916.

THANK YOU!

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7.6 Breakout Session results

7.6.1 International Room (EN)

Discussion prompt 1: What are your key issues or needs (in terms of solutions)?

Individual stakeholder responses/quotes from the discussion:

1. Suhad
    a. Discussed the example of Gustaf's farm in Sweden and needs can be mostly covered by the current WATERAGRI solutions
    b. Landlord of a big farm. Drought in farms, cannot continue production due to lack of water, increasing temperature due to climate change
    c. Nature-based solution: constructed artificial lake to harness rainwater when available for irrigation purposes (in association with ULUND and commune)
    d. Solutions such as farm constructed wetlands, water retainer product, and bio-char and a combination of these measures can be helpful here
    e. Future steps: Collect data and research how this can solve the problem
    f. No wasting any water (careful planning of every drop used), irrigation in a strategic way
2. Syed
    a. We give information but understanding is also critical
    b. Remote sensing products cannot be used directly by farmers; this information needs to be processed and broken down to answers three main questions for the farmer:
        i. How much, when, how water to be added?
3. Frost, ice, short growing seasons in the Nordic countries
    a. Problems vary across the case studies
    b. There is enough water, but the problem is getting water out of the system – drainage problems
4. Usability of end products is also critical
    a. Assuming that they have a computer, simplicity of communication (auto-bots/FAQs to guide farmers through the use of product)
    b. Simplification of interaction with the product – no overuse of technical terms, ease of use
    c. Needs to be tailored to the farmer's context -Room to change the product based on farmer's needs and incorporate their specific needs.
    d. Use of intuitive dashboards

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. Problems differ depending on the case study site e.g. while in some case studies there is lack of water. In Nordic countries, the problem differs – they struggle with more water (due to lot of ice, frost) and draining excess water from fields
2. Usability of the end product is critical
    a. Researchers should not assume that the farmer has a computer, can understand technical terms

b. Focus on simplicity of communication (auto-bots/FAQs to guide farmers through the use of product), be flexible to tailor the product based on farmer's specific needs

Discussion prompt 2: Out of the 6 solutions presented in the workshop, which ones do you find most appealing and why? If none, what solution do you have in mind?

Individual stakeholder responses/quotes from the discussion:

1. DET device
    a. Poland, Swedish, Hungary (5 partners)
    b. Trainings to use the machine and treat different types of sludge
    c. Originally meant for sludge, but also being expanded to soil – understand how long can soils retain water
2. Haidi – Remote sensing
    a. Extracting parameters from remote sensing data.
    b. Visual assessment- where is the problem in your farm
    c. Where exactly do you have to put more water or less
    d. Why would farmers want to use the solution?
        i. Price is cheaper compared to conventional methods
        ii. Monitor it over time without any physical interventions such as putting sensors
        iii. It has more coverage compared to putting sensors on a limited area of the field – easily scan the entire field quickly
        iv. Opportunity to use real-time data. Data will be available within one day (pre-processed images from satellites, apply atmospheric correction and other algorithms)
        v. Commercially company working since 2017. Soil moisture product is new – accuracy will be tested in Italy and Hungary for soil moisture data
3. Only one product is not enough
    a. Combination of methods needs to be explored
    b. Deficit irrigation based on remote sensing is also another upgrade of the existing product
4. Water retainer product
    a. How much water retention? And the impact on water cycle?

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. Based on limited information we have, WATERAGRI solutions seem to largely cover the needs but of course we continue to listen to the stakeholders needs as and when they arise - today's workshop is one such initiative to do so
2. One solution will not do the trick.
    a. Need to look into combination of solutions and interconnectivity between solutions depending on the case study site
    b. Modelling-based solutions can be combined with physical interventions such as wetlands

Discussion prompt 3: How do you see us working together to implement the solution of your interest? → What is your plan to engage with farmers and other stakeholders in the project?

Individual stakeholder responses/quotes from the discussion:

1. Will communicate once an initial model is developed – for feedback and specific needs
    a. Critical to incorporate local knowledge and context into the models
    b. Plan to initiate more stakeholder interactions
2. Local stakeholders are prioritizing interaction with researchers and so far they have a dedicated line for research queries, even with their busy schedule. They expect good benefits from the project.
3. We have farmers e.g. Gustaf who are also open to participate in research

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. Two way dialogue between researchers and the farming community is critical for success
    a. Critical to incorporate local knowledge and context into the models
2. Researchers need to be more proactive in approaching the farmers.
3. While initiating these interactions, do take timing into consideration – difficult to engage farmers during the sowing or harvesting season

7.6.2 Hungarian Room (HU)

Discussion prompt 1: What are your key issues or needs (in terms of solutions)?

Individual stakeholder responses/quotes from the discussion:

1. Koos, A.: legislative background – harmonization on EU level for products AND services
2. Koos, A.: new EU directives on agricultural product utilization (chemicals, etc.)
3. Rozsa, Helga: responsibility of product distributors from non-EU countries
4. business model background and cost benefit analysis specifically to any new product/service (SOULTIONS)

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. “common and clear” legislative background – harmonization on EU level for products AND services
2. new EU directives on agricultural product utilization (chemicals, etc.) – let s get ready to implement them, get prepared for those
3. responsibility of product distributors from non-EU countries (quality control burden on authorities)
4. business model background and cost benefit analysis specifically to any new product/service (SOULTIONS)

Discussion prompt 2: Out of the 6 solutions presented in the workshop, which ones do you find most appealing and why? If none, what solution do you have in mind?

Individual stakeholder responses/quotes from the discussion:

1. Biochar utilization options can be a good direction but holds potential danger.

2. Examples for surface runoff collection solution at farm scale level can be found in Hungary, and all the participant had good opinion about these solutions.

3. Evidence-based examples would be useful to make these for decision makers acceptable, since they have business considerations.

4. It would be great if the level of yield improvement of all solutions can be compared.

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. WATER RETAINER PRODUCT: in arid regions
2. FARM CONSTRUCTED WETLAND: in areas where excess water occurs

Discussion prompt 3: How do you see us working together to implement the solution of your interest?

Individual stakeholder responses/quotes from the discussion:

1. From Bay Z. - Koos A.: Project results must be formulated in view of the directives coming into force from 2022 (marketability of solutions)
2. Vattay R .: product registration processes should be carried out by country, separately -> if there will be uniform regulation from 2022, they will be simplified
3. Changing producer responsibility is more pronounced -> We can expect dangers in the case of products from distant, non-EU markets: the inspection work of NÉBIH takes months, withdrawal from the market
4. The problem of the lack of legislation on services is highlighted and agreed by all the participants.
5. “Uncontrolled” ways/methods of making / using farmers’ or other producers’ OWN compost tea can be dangerous and must be under supervision.
6. The CAP - Common Agricultural Policy has been forming here in Hungary, and there is a time to cooperate with the creators.
7. Value proposition - cost benefit analysis must be carried out every time to convince farmers and other stakeholders.

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. There is a need for evidence-based examples in order to apply any solutions with the support of decision makers (governments) and also to be desirable from the aspect of farmers
2. In Hungary, now, there is a “lucky” era for new solutions, frameworks, funding models, ideas&thoughts, which can be partly provided e.g. by WATERAGRI, since these years new, Common Agricultural Policy has been forming.

7.6.3 Polish Room (PL)

Discussion prompt 1: What are your key issues or needs (in terms of solutions)?

Individual stakeholder responses/quotes from the discussion:

1. Farmers can be encouraged to use new solutions by organizing meetings face-to-face and explaining their principles, costs and benefits in Polish language.
2. The farmers want to see the outcomes of proposed solutions before they decide to use them in their farms. An example of successful application in one farm would trigger a chain reaction.
3. The implementation of innovative solutions should receive financial support through e.g incentives or pilot programs.
4. The new solutions should not be expensive and complicated in usage.

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. Encourage farmers to use new solutions in face-to face meetings and discussion in native language.
2. Need for incentives (subsidies) to support implementation of the innovative solutions in agriculture.

Discussion prompt 2: Out of the 6 solutions presented in the workshop, which ones do you find most appealing and why? If none, what solution do you have in mind?

Individual stakeholder responses/quotes from the discussion:

1. In Poland there are about 1,5 mln farms of different size. The solutions should be effortless.
2. Irrigation is not popular because water uptake for irrigation needs permit required by Water Low Act. In many cases water availability is insufficient and would require building retention ponds.

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. Promising solutions are Remote sensing pipline, Constructed wetlands, Water retainer – not expensive, easy to apply, fast effects.
2. New innovation – automatizations of field work (robotics) – in Poland Agribot for spraying pesticides

Discussion prompt 3: How do you see us working together to implement the solution of your interest?

Individual stakeholder responses/quotes from the discussion:

1. Changing attitude of Polish farmers to test new solutions.
2. The new solutions should increase productivity and raise the standard of farmer's life style.
3. Training of farmers and agricultural advisors in water retention solutions.
4. Involvement in local initiatives related to water management.

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. Video conferencing is not effective in reaching farmers, Direct contact with farmers in native language – local workshops and other events – to show effects of proposed innovations.
2. If one farmer is convinced and has positive results it is easier to involve more followers.

7.6.4 Finnish Room (FL)

Discussion prompt 1: What are your key issues or needs (in terms of solutions)?

Individual stakeholder responses/quotes from the discussion:

1. Environmental issues in focus, what about production impacts/benefits, famer acceptance?
2. Costly and require space, wetlands a bit problematic and too few studies done (goes for most methods)
3. Nutrient and water balance approaches, yes this is cost-beneficial
4. Methods seen separately, not integrated solutions
5. Data needed on status of drainage (and agric. fields), e.g. how wet are the agricultural fields
6. Framework development good, to support decision making and to provide more information for decision makers, how on Finnish scale? Role of advisors. How info to farmers. Farm scale research.
7. Data management issues and framework scale. Farm scale/joint farms decision making. Catchment and sub-scale catchment scale

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. Farming benefits should be more in focus, some solutions costly
2. Solution should consider water management in an integrated way at farm and catchment scale with consideration to national/regional aspects (e.g. forests, soils, hydrology)
3. Data management issues and framework scale
4. ..

Discussion prompt 2: Out of the 6 solutions presented in the workshop, which ones do you find most appealing and why? If none, what solution do you have in mind?

Individual stakeholder responses/quotes from the discussion:

1. **Remote sensing pipeline interesting, data provide and DSS**
2. Drainage&Irrigation(water) and nutrient management, basic needs and cost-efficient
3. FCW interesting, but what is new?
4. Retainer interesting, but not in Finland (as irrigation normally not needed)
5. Drainage system, in Finland overland flow rare (80 % sub-surface)

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. Remote sensing pipeline very interesting, use of monitoring and satellite data and information management

2. Improved water balances and management in general is important, solutions needed for drainage&Irrigation(water) and nutrient management
3. ..

Discussion prompt 3: How do you see us working together to implement the solution of your interest?

Individual stakeholder responses/quotes from the discussion:

1. Jointly share ideas and experience is useful
2. Transfer knowledge across countries
3. Field visits useful
4. Collaboration with other projects
5. Data sharing and governance/management solutions (country specific)

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. Sharing ideas and project info important in general for learning and development
2. Sharing info in Finland important (we decided to have a follow-up meeting series and start with controlled drainage, sub-irrigation)

7.6.5 German Room (DE)

Discussion prompt 1: What are your key issues or needs (in terms of solutions)?

Individual stakeholder responses/quotes from the discussion:

1. Iris Kormann, Pro Agriculture Seeland/Switzerland:
    a. Main problem is rather waterlogging in peaty soils, in spring with a lot of snow, - not so much the focus of the presented Wateragri solutions, more of the real-time modelling for optimized water management.
    b. Water scarcity is not so much the problem, more optimizing drainage and irrigation
    c. If it gets drier and hotter in future – question how irrigation could be optimized
    d. If using wetlands – question if space on fields is available
2. Albert Bernsteiner, Chamber of agriculture Styria/Austria:
    a. Water scarcity in summer is already an issue, groundwater levels are falling – dealing with the question if it is possible to use groundwater for irrigation - The extent to which missing water can be used for irrigation by river abstraction needs to be clarified in the legal framework .
    b. Focus on improvement of agricultural soil: to what extent can we improve the soil – to store nutrients better?
    c. Drought on the one hand, heavy rainfall on the other: large amounts of rain in a short time – difficult to keep soil on the field - erosion problem
3. Martin Regelsberger - Researcher – information from farmers in Styria/Austria:
    a. Increasingly long dry periods, very little precipitation in Styria for a very long time, Currently, there is actually hardly any irrigation. First fruit farmers have started to irrigate - farmers are increasingly looking to irrigation to cover gaps in precipitation.
    b. Soil erosion due to compaction of the land and low infiltration. Experiencing erosion even before heavy rainfall events - even medium rainfall and slope is

then a problem -> water stands for a long time and prevents important cultivation steps e.g. harvest

c. Martin is interested in the difference in water infiltration between organic and conventional agriculture
d. Current problems with farming with a focus on soil: Waterlogging, loss of humus in the soil, compaction through tillage, erosion and leaching of humus/destruction of soil health by fertilization

4. Albert Bernsteiner:
    a. Question: Improve humus build-up, CO_2 storage and at the same time improve water retention in the soil - how to reconcile?
        i. Martin: there is literature on humus and water storage but not clear because many parameters, sensors do not measure accurately enough. Manuel Böhm had data from sprinkling experiment: at 1% humus content per hectare 32m^3water stored, at 2% humus share per hectare 160m^3. Infiltration rate depends on the nature of the soil. Ecovillage: active in certificate trading, collecting data and how to relate to water balance.
        ii. Miklas: milieu mathematique - how to enrich carbon in agriculture, develop methods, CW or natural wetlands: the older such a wetland is, the better as a carbon sink.
5. Johanna Ecklmayr, Soil.Water.Protection Consulting Upper Austria:
    a. CO_2 certificate trading is questionable - studies in Upper Austria: humus content in grassland – humus did not increase over 20 years, cannot be changed. Questionable whether humus can be built up in agricultural lands - question whether possible for CO_2 trade.
6. Harrie-Jan Hendricks-Franssen – Researcher FZJ - information from farmers in Germany:
    a. Germany - increasing dryness in summer (700mm precipitation but going down), potential evaporation increasing, water scarcity increasing. On the other hand, soils very productive – farmers ask themselves if it is worth investing in irrigation. Little irrigation but increasingly dry summers. Farmers have to deal with nitrate pollution in groundwater: penalty by EU - treatment for nitrate

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. Problems differ depending on the area:
    a. in Seeland/Switzerland the main problem is waterlogging, water scarcity is only a problem during short periods in summer, when drainage and irrigation have to be optimally coordinated
    b. in parts of Austria water scarcity is an issue, increasingly long dry periods, the groundwater level drops, drought and heavy rainfall events (but even medium rain events can cause problems) – difficulty to keep soil on the field, farmers are increasingly looking for irrigation to cover gaps in precipitation, soil erosion due to compaction of the land and low infiltration
    c. in Germany also increasingly dry summer, water scarcity increases, farmers deal with the question if it is worth investing in irrigation
2. Improve retention capacities and focus on nitrate inputs, nitrate pollution in groundwater is a topic, farmers have to deal with – pressure from EU, EU Water Framework Directive - how to reach good groundwater quality
3. How to solve several problems at once like improving water system in the soil and simultaneously building humus and CO_2 storage

Discussion prompt 2: Out of the 6 solutions presented in the workshop, which ones do you find most appealing and why? If none, what solution do you have in mind?

Individual stakeholder responses/quotes from the discussion:

1. Iris Kormann: The presented solutions are not really relevant for the Seeland, maybe wetlands or remote sensing products. The solution that could help is the one which is currently being implemented, the real-time modelling to optimize drainage and irrigation
2. Albert Bernsteiner:
    a. To what extent can soil be improved? Store water and nutrient content better and more sustainably, increase retention capacity in the soil -> soil water retainers
    b. Satellites / Sentinal data, there is a need to create a better data basis on how economically or efficiently we can/must use water
3. Real-time modelling, Real-time-water-demand, remote sensing – satellite images
4. Farmers interested in forecasting - data assimilation; framework

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. Soil water retainers
2. Farmers interested in forecasting: Real-time modelling, Real-time-water-demand, Remote sensing
3. Using data for irrigation and nutrition management

Discussion prompt 3: How do you see us working together to implement the solution of your interest?

Individual stakeholder responses/quotes from the discussion:

1. Iris Kormann: Communication between WATERAGRI and the stakeholders/farmers needs to be good and better than in the current situation: what does it bring to the farmers? what is the aim of the project? How does it actually (concrete, with quantification) help the farmers? What comes next and what comes after WATERAGRI?
2. Albert Bernsteiner: focus on one issue, at the first workshop we looked at a field in Gleisdorf (Case Study Austria) - what happens if I work with a plough or a cultivator, difference in soil cultivation (storage density, nitrogen supply capacity, humus content) in a model and for scientific support for practice. Accompaniment and decision-making aid (is the cultivation beneficial or does it have to be changed) decisions on how to optimally continue/change to alternatives, e.g. variations in the direction of crop rotation?
3. Marius Schmidt - FZJ - Contact with farmers for Selhausen site: problem small area, 10 farmers and only 2 willing to implement something, personal meeting is currently not possible but personal approach would be important, online format is not optimal

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. Must be well communicated what the project specifically brings to the farmers in the region.

2. Personal contact with farmers is really important and should be the preferred way of communicating as soon as it is possible - Online format is not ideal to reach out to farmers
3. Scientific support for farmers: accompaniment and decision-making aid

7.6.6 French Room (FR)

Discussion prompt 1: What are your key issues or needs (in terms of solutions)?

Individual stakeholder responses/quotes from the discussion:

1. **Sophie Durandeau**, Seine_Normandie Water Agency: water quality in catchments, water management
2. **Hana Ghlouci**, SERPN Water Union: need for quality of water, how to cut down water micropollutants at the catchment?
3. **Claudine Ferrané**, Water Ressources Center : how to cut down the fields'emissions for water quality and farm autonomy?
4. **Laurette Paravano**, Agricultural Chamber of Yonne : how to cut down the water pollutions in the fields and in the catchments, in areas water tranfers are superficial (artificial drainage) and then subterranean.
5. **Raymond Reau**, National Institute of Research for Agriculture, Food and Environment: water quality and water management. Cheap solutions and ready for use by local stakeholders.
6. **Lang Fribourg**, from Switzerland, OIEAU and OBTAIN project.

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. Water quality : main issues for the french stakeholders are pollution by nitrates, pesticides, and micropollutants
2. Working at field level, and downstream after the fields (in superficial water, an subterranean water)

Discussion prompt 2: Out of the 6 solutions presented in the workshop, which ones do you find most appealing and why? If none, what solution do you have in mind?

Individual stakeholder responses/quotes from the discussion:

1. Sophie : actually, we are already using the data from remote sensing; the water-retainer is an interesting challenge; and to solve the problem of water quality, we prefer preventive actions rather than curative actions.
2. Hana : wet buffer zones as many solutions have only a partial effect, not sufficient enough to obtain the required water quality. What about the effects of combination between wet buffer zones and biochar?
3. Claudine : is interested in 2 solutions, the farm constructed wetland and the drainage system, in order to get rid with pesticides pollutions. The water retainer : I know a farmer who experimented it, 20 years ago.
4. Laurette : is also interested in 2 solutions, the farm constructed wetland and the drainage system. How could we combine different solutions, as for instance field practices and water treatment practices? I would like to know more about efficiency conditions of the different solutions. A farm with irrigation is going to test the water retainer in Yonne department.

5. Raymond : is interested in farm constructed wetland, drainage filter, et remote sensing at territory scale.
6. Lang Fribourg : asks a question about water retainer : isn't more efficient to increase the organic matter of the soil to retain more water ? Furthermore, I have not understood the solution 6, about water turbidity.

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. The test of a combination of solutions would be interested for several stakeholders of the group : farm constructed wetlands mixed with drainage system (biochar) technology. There is a need for integration of solutions in order to solve problems of pollution of water by herbicides.
2. Use of remote sensing could be useful to manage the action plans of the catchment area, but it must be adapted to territory level management.
3. Water retainer will be experimented by a farmer of Yonne region

Discussion prompt 3: How do you see us working together to implement the solution of your interest?

Individual stakeholder responses/quotes from the discussion:

1. Sophie : it is not very clear, yet…
2. Hana : I am ready to experiment the drainage system in Normandy (France)
3. Claudine : in the Catchment Ressources Center, we don't experiment solutions; our objective is to accompany the catchment area's manager.
4. Laurette : we are interested in working at the territory scale, in knowing the efficiency of the drainage systems, and in combining farm constructed wetland and drainage systems.
5. Lang Fribourg : in order to build bridges with OBTAIN project, I'm interested in the the measures you are going to realize in WATERAGRI.

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. How to share our different results about the solutions efficiency on water quality ? (Water retainer, biochar, farm constructed wetlands…)
2. How to work at territory scale, at farm scale and at field scale ?
3. What technologies are useful for global governance of territories

7.6.7 Italian Room (IT)

Discussion prompt 1: What are your key issues or needs (in terms of solutions)?

Individual stakeholder responses/quotes from the discussion:

1. In Italy we are facing water scarcity since decades and there are already many solutions implemented since long time, to better combine the impacts and the trade-offs is the main issue right now
2. Adapt to both climate change and new EU policies. The overlapping impacts of both are expected to cause unknown effects on the food production chain and on the Made in Italy agri-food industry

3. Reconcile agriculture excellence with sustainable management of the agro-ecosystem.
4. Secure access to water to farmers
5. Restore soil fertility
6. Ecosystem services payment to farmers

Discussion prompt 2: Out of the 6 solutions presented in the workshop, which ones do you find most appealing and why? If none, what solution do you have in mind?

1. Individual stakeholder responses/quotes from the discussion:
2. Some solutions are applicable only at irrigation district level (collective management) or will not offer economic benefits justifying the investments and operational costs
3. Nature Based Solution can be of interest when designed to be multipurpose and not just in favor of the environment but put in charge of farmers as a cost

Discussion prompt 3: How do you see us working together to implement the solution of your interest?

Individual stakeholder responses/quotes from the discussion:

1. Demonstration of effectiveness and impacts, beside a risk analysis, are required to convince farmers and decision makers

7.6.8 Swedish Room (SE)

Discussion prompt 1: What are your key issues or needs (in terms of solutions)?

Individual stakeholder responses/quotes from the discussion:

1. Modelling of irrigation – farmers and other stakeholders will need guidance.
2. We need to find ways of storing rain- and ground water. In March it was so wet the farmers could not enter the fields with their machines. One month later and they will complain about the draught and lack of rain.
3. The insecure / irregular water supply is making all these questions highly important

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. Urgent need for incentives (subsidies) to constructions of water reservoirs as well as guidance and knowledge to the people using the irrigation
2. Sensors in the fields as supporting tools can become highly efficient.

Discussion prompt 2: Out of the 6 solutions presented in the workshop, which ones do you find most appealing and why? If none, what solution do you have in mind?

Individual stakeholder responses/quotes from the discussion:

1. Irrigation is not popular in part of the country where farmers will need to construct dams. In other parts of the country there is easily access to ground water for irrigation and highly used.

2. No real support system in place whenever a farmer agrees to use new decision-making and sensor-based systems. Will need to teach end-users.
3. Support by Government agency, Jordbruksverket is key and will be initiated by Fereshteh Pourazari at RISE

Summarize the discussion in max. 3 points (to be reported back in the plenary)

1. Promising solutions are Constructed wetlands, Precision farming, Water retainer – and Bio Char.

Discussion prompt 3: How do you see us working together to implement the solution of your interest?

Individual stakeholder responses/quotes from the discussion:

1. RISE is trying for 6 months to gather information about drainage and irregaion systems in Sweden and to bouild up a data-base. Simultanoulsy building up contacts and knowledge and asap will visit GN's test site as well as team at ULUND.
2. We agreed we need a focused meeting with all our respective government authorities to promote irrigation and water government. (this led to a brief discussion about cover crops and growing systems)