NPP-SOL

MODELLING AND TECHNOLOGICAL TOOLS TO PREVENT SURFACE AND GROUND-WATER BODIES FROM AGRICULTURAL NON-POINT SOURCE POLLUTION UNDER MEDITERRANEAN CONDITIONS

Term of reference for a service provider in support for communication and dissemination

1. Context

NPP-SOL (Modelling and technological tools to prevent surface and ground water bodies from agricultural non-profit source pollution under Mediterranean conditions) is an awarded project under the PRIMA Programme "Partnership for Research and Innovation in the Mediterranean Area", Section 2 (Projects funded by Participant States), – Multi-topic 2022 - Topic 2.1.1 RIA (Prevent and reduce land and water salinization and pollution due to agri-food activities).
The general objective of NPP-SOL is to prevent diffuse pollution of water resources due to NPS agricultural pollutants under the Mediterranean soil and environmental conditions, according to the objectives of the new Green Deal and Farm-to-Fork strategies. NPP-SOL will integrate site-specific best management practices for improving soil, water, fertilizers and crop management with site-tailored and affordable-costs technologies for preventing natural bodies pollution. Common to all the adopted methodologies-technologies will be their sustainability and economic efficiency, and their adherence to circular economy approaches.
CIHEAM Montpellier participates in this project as a partner and is the leader and the co-leader for different work packages (WP) within the project.

2. Description of the work package and tasks

Under NPP-SOL's Work Package 5 for which CIHEAM Montpellier is the leader, different tasks will be undertaken in the objective of:

- Communication and dissemination of the project's activities and results, with the final objective of amplifying and raising awareness about NPP-SOL added value in economic, technical, environmental and social terms.
- Dissemination of the results to stakeholders beyond those directly engaged in the project.

To assure the quality of these tasks' implementation, a sub-contracting third party (hereinafter service provider) is needed to support CIHEAM Montpellier team.

3. Description of main tasks required

The role of the service provider is to ensure in the communication's activities and other tasks set out in the WP5 of NPP-SOL (see the annex 3: NPP – SOL full proposal)

More specifically, the service provider will be requested to:

Activity 1 (in relation with Task 5.1 and Task 5.3 of WP5)

- Elaborate an outward strategy with the preparation and implementation of a roadmap for the communication, dissemination, capacity building, scaling out and project's results exploitation
- Develop the visual identity of NPP-SOL.
- Elaborate a project website and keep constant update of a project website.
- Develop virtual communication activities.
- Elaborate basic communication tools including a leaflet and targeted factsheets and infographics.
- Carry out media relations.
- Prepare and publish newsletters (e.g., biyearly electronic newsletters) will also be issued with news, events, and progress updates;
- Make videos for an overview of the activities in the study areas.

In the third year of the project, the participation of NPP-SOL partners in **international thematic conferences** will be supported to maximize the NPP-SOL outcome visibility

Activity 2 (in relation with Task 5.4 of WP5):

Assist CIHEAM Montpellier in different training sessions and demonstration events, more specifically for:

- Preparation of a detailed plan for the on-site trainings and case studies
- identification and invitation of stakeholders and participants
- communication for the trainings and events

4. Budget

The overall budget for the sub-contract is ***46 800 euros*** (forty-six thousand and eight hundred euros)

5. Duration and Location

Duration: The overall execution period of these tasks is around two years and a half (from 15/12/2023 to 31/08/2026)

Location: Home country of the service provider with possible missions to project participants' countries (Italy, France, Israel, Morocco)

6. Required qualifications

The service provider must meet the following requirements:

- be able to develop a targeted and effective outward strategy for the communication, dissemination, scaling out and NPP-SOL project's results exploitation;
- be able to create and assuring the conditions for a long-standing dialogue with the stakeholders, governmental bodies, international organizations, research centers, ONG and the academic sector in Mediterranean countries;
- be able to promote the interest and the public awareness towards the issues of sustainable agriculture and natural resource use efficiency, food security, poverty reduction, strengthening institutional capacity, efficient use of natural resources, adaptation to climate change, integrated management of coastal areas, women empowerment;

- support NPP-SOL project' partners in the communication, dissemination and scaling out activities to maximize the impact of the project and a larger adoption of the innovative and environmentally friendly technical solutions proposed

7. Submission of proposal

Interested applicants are invited to submit the following:

Technical part:

- The supplier's 3 recent references and experience for similar services (see annex 1)
- The CVs of those involved and the sharing of responsibilities

Financial part:

A quotation including a budget breakdown of the main planned tasks (see annex 2).

The quotation must specify the cost (VAT-exclusive and VAT-inclusive) and include ***the company registration number or its local equivalent as proof of its legal existence; full bank details of the service provider: IBAN, SWIFT code, name and address of his/her bank***

8. Submission deadline and selection procedure

The deadline for the quotation and proposal submission is **the 29th November 2023 at 12 pm (Paris time)**

Proposals should be submitted **in English** by email with the subject "**NPP-SOL service provider proposal"** addressed to:

Hatem BELHOUCHETTE, NPP-SOL Scientific Member: belhouchette@iamm.fr

Georgios KLEFTODIMOS, NPP-SOL Scientific Member: kleftodimos@iamm.fr,

Nhien NGUYEN: nguyen@iamm.fr

The candidates will be informed by e-mail of the results of the selection 10 days after the submission of the offers at the latest

The selected candidate will be issued a contract with the CIHEAM Montpellier specifying the final delivery and completion schedule for the planned tasks, as well as the terms of payment. This contract will be valid until all the services requested have been provided.

ANNEX 1: Template for list of relevant experiences (only the last three experiences are needed)

Experience	Description	Dates	Funding received by your organization
1. *(For example: the name of the project for which the company, NGO/organisation was involved)*	*Please detail the role of your organization/company/NGO etc. and activities for which it is involved, in which context (funded by what agency/organization?)*		
2.			

ANNEX 2: Example for quotation

N°	Description	Unit cost (in euros)	Quantity (*for example: persons/month; number of trips…)*	Total cost in € excluding tax	Cost in €, including tax
	Activity 1				
1	*(For example: 2 Experts names and qualification)*				
2…					
	Activity 2				
1	(For example: travel….)				
2…					
			TOTAL COST		

ANNEX 3: Full proposal NPP-SOL

Title of Proposal: MODELLING AND TECHNOLOGICAL TOOLS TO PREVENT SURFACE AND GROUND-WATER BODIES FROM AGRICULTURAL NON-POINT SOURCE POLLUTION UNDER MEDITERRANEAN CONDITIONS
Acronym: NPP-SOL

List of participants

Participant N.	PI name	Organisation	Country
1 Partner (Coordinator)	Antonio Coppola	University of Basilicata (UNIBAS)	Italy
2 Partner	Stefania Da Pelo	University of Cagliari (UNICA)	Italy
3 Partner	Albert Soler Gil	Universitat de Barcelona (UB)	Spain
4 Partner	Hatem Belhouchette	Mediterranean Agronomic Institute of Montpellier (CIHEAM-IAM)	France
5 Partner	Roy Posmanik	Agricultural Research Organization – Volcani Institute (ARO)	Israel
6 Partner	Roey Egozi	Ministry of Agriculture and Rural Development (MOAG)	Israel
7 Partner	Abdelmjid Zouahri	National Institute of Agricultural Research (INRA)	Morocco
8 Partner	Souad El Hajjaji	Mohammed V University of Rabat (UM5)	Morocco

Main Abbreviations used in the text (in alphabetical order)
AD=Anaerobic Digestor; **BF**=biofiltration; **BR**=Bioreactors; **CAFO**=concentrated animal feeding operations; **CS**=Case Studies; **CT**=Co-Testing; **CW**=Constructed wetlands; **EA=**Environmental Agencies; **FA**=Farmers Awareness; **FU**= Field Unit; **GAP**=Good Agricultural Practices; **HTC**=Hydrothermal carbonization; **MT=**Modelling Tools**; NPS**=Non-point source**; NVZ**=Nitrate Vulnerable Zones; **PPT=**Pollution-Preventing Technologies**; PSA**=Pollutant Sources Analysis; **SE**=Stakeholders Entities**; SHR-HUB**=Stakeholders-Researchers HUB; **SO**=Specific Objectives; **SSBMP**=Site-Specific Best Management Practices; **TCB**=Capacity Building; **US**=Upscaling; **WRM**=Water Resources Managers; **WUA=**Water Users Associations**.**

1. Excellence

The Mediterranean coastal zone is particularly exposed to considerable pressure on water resources, especially by agriculture. Irrigated agriculture in Mediterranean countries is the most water demanding sector with about 66 billion m^3/year[1] with an increasing trend (the irrigated area has more than doubled in 40 years) due also to increased population and food demand. The growing agricultural needs have been mainly met by a concurrent increase of 1) water resources exploitation and 2) nutrients (mostly nitrogen and phosphorus) applications.
The increasing water use has induced soil salinization problems, especially in the frequent cases of ineffective irrigation management, and in wide Mediterranean coastal areas irrigated agriculture is now possible only using saline water. In these cases, irrigated agriculture may only be practised by using excess irrigation water to keep soil water salinity below levels critical for crop growth.
Concurrently, increasing levels of nutrients have determined serious problems of both surface and groundwater pollution. Several countries in the Mediterranean are affected by agricultural Non-Point Source (NPS) nitrate and phosphorus pollution of aquifers and surface waters (estuaries, lakes, wetlands, etc.), especially frequent in areas of intensive agriculture and livestock activity. Agricultural practices are responsible for the 50-80% of the overall nitrogen loads to the water bodies[2]. Actually, in many cultivated areas, nitrate concentrations exceed the limit of 50 mg NO_3/L for drinking water. The problem mainly arises from the concurrent effects of low efficiency in the use of both nutrients and irrigation.
In the perspective of reducing pollution of water bodies, a set of rules and regulatory mechanisms have been set out in national and supranational regulations that farmers have to comply with to preserve the environment and meet the recent **new Green Deal strategy**. In 1991, the European Union adopted the Nitrates Directive (91/676/CEE) to protect water quality by preventing nitrate leaching from agricultural activities and promoting the adoption of Good Agricultural Practices (GAP). The Directive imposed the identification of Nitrate

[1] United Nations Environment Programme/Mediterranean Action Plan and Plan Bleu, 2020. State of the Environment and Development in the Mediterranean. Chapter 6: Food and water security
[2] European Environment Agency 2018, European waters - Assessment of status and pressures.

Vulnerable Zones (NVZ), where farmers are required to comply with specific limits of inorganic fertilisers and organic slurry application rates (not more than 170 N/ha/yr). The regulatory and mandatory (even through sanctions) approach has not been successful. In most of the NVZs, nitrate concentration in water bodies frequently still exceeds the limit of 50 mg/L NO_3. Likewise, many coastal wetlands suffer from periodical algal blooms and murky waters, which poses serious conflicts between aquatic ecosystems and agriculture, as witnessed by the significant wetland deterioration in the Mediterranean region[3].

The failure in this regulatory approach may be ascribed to interrelated economics-social and technical-physical reasons: 1) Farmers may see mandatory rules as an obstacle to maintain and increase farm productivity and incomes; 2) Limiting manure applications would mean reducing the number of livestock units per hectare, which could have dramatic economic and social impacts on many areas based on livestock farming economy (e.g. Arborea Plain, Sardinia Region, Italy); 3) Under salinity conditions, limiting nutrient losses would conflict with the need of applying excess water to leach salts; 4) The GAP themselves, even when the farmer wants actually to apply them, are not site-specific and may produce very different – sometimes even worsening - results depending on the site-specific physical conditions (soil hydrological regime, climate, etc.).

Based on this evidence, there is a need for a paradigm change, looking for more site-specific approaches, more oriented to support farmers rather than sanctioning and limiting their entrepreneurship. This might be the way for maintaining the trade-off between the needs of sustaining farmers' income and limiting detrimental environmental impacts of NPS pollutants, which is a cornerstone of sustainable agriculture.

In this direction, predictive and technological tools are now available to identify the best site-specific water and nutrient management and to prevent NPS pollution of water bodies, even in the salinity conditions frequently encountered in many areas of the Mediterranean. As for predictive tools, user-friendly dynamic physically-based models are available to simulate water flow and solute transport in the whole soil-plant-atmosphere system, able to provide quantitative predictions of NPS pollutant transport (salts, nutrients, pesticides, heavy metals) in the vadose zone and from this to the groundwater and to the surface water[4], allowing to provide more informed decisions on nutrients application, better tailored to crop needs, as well as to their ecohydrological impact.

Technological tools are also available, which have already demonstrated their effectiveness in the operational environment (**TRL 6-7**), and that can be used to prevent nutrient release to water bodies. They may be technologies such as anaerobic digestion, aiming at minimising the NPS pollution by untreated manure and liquid effluents, to bioreactors and artificial/constructed wetlands, simple, low cost and passive treatment systems for removing nitrate and phosphorus (and even pesticides) from both surface water run-off and shallow groundwater systems[5]. Uniform and *one-sized* strategies for all the conditions should be avoided, as they have been generally perceived by the farmers as distant and out of their control. By contrast, farm-scale technologies but diffuse over the whole agricultural basin could be seen closer by the single farmer, who could closely and immediately perceive the impacts of introducing new practices and technologies.

1.1 Objectives

The general objective of NPS-SOL is **to prevent diffuse pollution of water resources due to NPS agricultural pollutants under the Mediterranean soil and environmental conditions**, according to the objectives of the new Green Deal and Farm-to-Fork strategies. NPP-SOL will integrate **site-specific best management practices for improving soil, water, fertilizers and crop management with site-tailored and affordable-costs technologies for preventing natural bodies pollution**. Common to all the adopted methodologies-technologies will be their sustainability and economic efficiency, and their adherence to circular economy approaches.

NPP-SOL has the following, interrelated **Specific Objectives (SO):**

SO1. Providing **Modelling Tools (MT)** integrating dynamics, physically-based agro-hydrological models to bioeconomic models, to evaluate alternative soil, water, and crop management strategies, reducing nutrient

[3] Ramdani and Elkhiati, 2006 – MELMARINA Research Project Report.

[4] Coppola et al., 2012. Dual-permeability model for flow in shrinking soil with dominant horizontal deformation. Water Resources Research, Vol. 48, W08527, doi:10.1029/2011WR011376; Coppola et al., 2015. Simulated Preferential Water Flow and Solute Transport in Shrinking Soils. Vadose Zone J. doi:10.2136/vzj2015.02.0021; Coppola et al., 2019. Identifying optimal irrigation water needs at district scale by using a physically based agro-hydrological model. Water 2019, 11, 841; doi:10.3390/w11040841.

[5] Christianson et al., 2021. Effectiveness of denitrifying bioreactors on water pollutant reduction from agricultural areas. Transactions of the ASABE, https://doi.org/10.13031/trans.14011.

losses in water bodies, improving crop productivity, and identifying the proper nutrient management under saline irrigation water. MT will support Site Specific Best Management Practices (SSBMP) and Pollution-Preventing Technologies (PPT) designing.
SO2. Co-designing **Site-Specific Best Management Practices (SSBMP)** to improve soil, water and crop management and efficiently use irrigation water and nutrients under site-specific pedo-hydrological, agronomic, economic and climatic conditions.
SO3. Co-designing, implementing and testing **small-to-medium, affordable-costs, in situ bioremediation** and **nature-based Pollution-Preventing Technologies (PPT)** aiming to **intercept** and **remove** NPS pollutants before they reach the groundwater and surface water bodies. Specifically, **Bioreactors (BR)** and a **Constructed Wetland (CW)** will be set up to remove nutrients (and pesticides) from surface runoff and/or drainage water coming from agricultural fields, whereas **Anaerobic Digestors (AD)** will be set up to preliminary treat livestock slurries before they are spread to the soil.
SO4. Developing **Farmer Awareness (FA)** and **Building Technical Capacity (TCB)** of technicians from Water User Associations (WUA), Environmental Agencies (EA), and Water Resource Managers (WRM) to apply and spread NPP-SOL SSBMP and PPT throughout the area affected by NPS pollution, monitor the effectiveness of applied technologies, manage maintenance and fine-tuning over time, and support the farmers beyond the lifetime of the project.

1.2 Relation to call and topic

NPP-SOL relates to the call: Section 2 – Multi-topic 2022 - **Topic 2.1.1 RIA** Prevent and reduce land and water salinization and pollution due to agri-food activities.
Under the Topic Challenge, NPP-SOL addresses the **connection between surface water and groundwater exploitation and poor groundwater quality**, the **salinization of aquifers** and the **prevention of eutrophication of wetlands and coastal water bodies**. It also contributes to promoting sustainable agricultural practices and reducing agricultural NPS pollution that carries phosphorus, nitrogen, pesticides and other organic pollution, metals, pathogens, salts and trace elements. The proposed project fulfils the Topic Scope by providing what is briefly described in the table below:

Scope (from Topic 2.1.1)	**How is addressed by NPP-SOL**
1. Reduce the risk of water pollution and salinization from agriculture	NPP-SOL explicitly aims to reduce NPS pollutants to receiving water bodies by integrating **MT, SSBMP, PPT, TCB** and **FA** approaches.
2. Specificities of the prevailing Mediterranean soils and environmental conditions should be considered	The adoption of **SSBMP** will assure the provision of **site-specific solutions** for the Mediterranean site considering the local constraints of soil, water, climate and agronomy.
3. Pollution restoring water bodies to acceptable water quality standards while ensuring profitable agri-food activities	The effects of NPS on aquatic habitats (eutrophication, temperature increase, toxicity, salinity, oxygen depletion) will be progressively reduced by integrating **MT, SSBM** and **PPT**. SSBMP and PPT will be strictly connected, with SSBMP aiming to reduce the pollutant loads and the PPTs aiming to finalise the abatement of the pollutants already attenuated by the SSBMP. In addition, NPP-SOL is based on affordable, small-scale solutions with low maintenance and operating costs that do not significantly impact **farmers' income** and preserve **farmers' competitiveness.**
4. Water reuse and the valorisation of other by-products from the surrounding agri-food processing plants to minimise the external use of resources, avoiding further contamination of land and water	The proposed PPT aim to strengthen the **circular economy** (e.g. valorisation of local wine and dairy industry by-products) and help producers adopt environmentally-friendly farming practices in livestock management. They allow for **the recovery of energy and nutrients**, key to a circular economy that aims to minimise the carbon footprint of intensive agriculture and enhance ecosystem services.

5. Provide more informed decisions on organic matter and mineral fertiliser application better tailored to crop needs, soil conditions, and the agroecosystem's nitrogen cycle	**MT** includes a dynamic agro-hydrological model (**FLOWS-HAGES)** that allows simulations of phosphorus and nitrogen transport. FLOWS-HAGES is also able to identify the actual water and nutrient needs of crops and determine the optimal timing, quantity and quality of irrigation water and nutrients to be supplied.

Table 1.1 NPP-SOL in relation to the Scope Topic

1.3 Concept and methodology

(a) Concept

1.3.1 Overall concept underpinning the project

The concept underpinning the project stems from the recognition of the complexity of agricultural NPS problems. This complexity requires different types of solutions from farmers and WRM, WUA and regional and national EA. This is certainly more challenging than acting with *all-purpose* solutions (which generally means qualitative and vague solutions).

On one side, solutions must come from a change of attitude in the management of irrigation water and nutrients by appropriately quantifying their profitability and by incentivising the agricultural sector to maximize the economical return per unit of water and nutrients. This can be achieved by providing them with appropriate support tools to correctly identify actual crop water and nutrient requirements and determine the optimal timing, quantity and quality of irrigation water and nutrients to each farm to maximise crop yields, while minimizing deep percolation and/or runoff fluxes of water and nutrients, and thus water losses and ground and surface water degradation. In this context, the use of **dynamic, physically-based agro-hydrological models**, describing simultaneously water, nutrients, salts and other solute processes, coupled to **dynamic bioeconomic models**, may significantly enhance the management of irrigation water and fertilizers resources by farmers, even in presence of salinity.

On the other side, in strict collaboration with EA, WUA and WRM, technological tools must be made available **to prevent** the detrimental environmental impact upon soil and water resources coming from agriculture NPS pollutants, possibly **by intercepting** the pollutants before they reach the groundwater and surface water bodies. **Big-sized interventions should be avoided**, as the farmers generally perceive them as distant and out of their control. By contrast, NPP-SOL promotes **small-to-medium** (small = farm scale; medium = group-of-farms scale) **technologies** but **diffuse over the whole agricultural basin,** which **have the advantage** that the farmers may closely and immediately see their impacts on the quality of the water leaving the cultivated depth to the shallow groundwater and/or the surface drainage network, and from this to natural wetlands and coastal zones.

Obviously, farmers have to be assisted and supported by WUA, EA, WRM. The proposal includes an essential part on TCB dedicated to the training of technicians who will have the role of supporting farmers beyond the project duration (i) in the application of site-specific best practices generated by the project, (ii) in monitoring the effectiveness of the applied technologies and their fine-tuning over time, and (iii) in spreading the tested and optimised technologies throughout the area affected by NPS pollution.

Several WUA, EA and WRM, institutions whose mandate is to manage water resources and protect their environmental quality in the partner countries, have co-designed this proposal and confirmed their willingness to participate in the NPP-SOL partnership and activities. The following table provides the list of the main Stakeholder Entities (SE) involved throughout the project:

Stakeholders Entities (SE)	Country
Oristano Land Reclamation and Irrigation Consortium; River Basin District Agencies (ADIS); Regional Environmental Agencies of Sardinia (ARPAS).	Italy
Spanish Geological Survey (IGME); Cooperative "Virgen de la Oliva"; General Community of Irrigators nº XI of the Bardenas Canal.	Spain
Kishon River Drainage Authority; Jewish National Fund; Kibutz Alonim; Ministry of Environmental Protection; Israel Nature and Parks Authority; Moshav Bet Lehem Haglilit; Israel Water Authority.	Israel
Regional Office for Agricultural Development of Gharb (ORMVAG); Bouregreg and Chaouia Watershed Agency (ABHBC).	Morocco

Table 1.2 List of Stakeholders Entities (SE) involved in NPP-SOL

1.3.2 Inter-disciplinary nature of the partnership and use of stakeholder knowledge

The complexity of NPS pollution requires adopting **specialized, interdisciplinary and multi actors' approaches**. The Consortium and the main SEs involved provide expertise in surface and subsurface hydrology, soil science, agronomy, chemistry, economics, social sciences, and experience in irrigation water and fertilizers management; agro-hydrological modelling tools development; irrigation technologies and managing crop systems development; interventions design for preventing agricultural water pollution; complex geo-chemical analyses (e.g. isotopes) to identify sources and fate of pollutants in water bodies.
All partners involved in the **Consortium have a long-standing relationship with the SEs in their country**. As a result, there is a shared and widespread knowledge of (i) the main constraints of each NPP-SOL case study and (ii) the real needs and opportunities towards which to strive. This is why the **co-design approach** has been chosen as **the foundation and leverage of this project**.

1.3.3 Projects related to NPP-SOL

The NPP-SOL Consortium has a documented valuable knowledge development in the geographical areas and research domains embraced by the proposal. The several international and national research activities, carried out by the NPP-SOL partners, put the Consortium in an ideal position to positively progress research and innovation in the case study areas and beyond. NPP-SOL will seek data, tools, experiences, and lessons by several past research projects involving the NPP-SOL partners mainly related to the water resources pollution issues, and create synergies with ongoing projects to build on existing knowledge and enhance the exchange of experience. Following the main research initiatives related to NPP-SOL: **EXCEL4MED** (HORIZON Europe, **ongoing**) Excellence hub in green technologies: Introducing innovation ecosystems in the Mediterranean food value chain; **AGREEMed** (PRIMA, **ongoing**) Innovative Aquifers Governance for Resilient Water Management and Sustainable Ecosystems in Stressed Mediterranean Agricultural Areas; **AGRO-SOS (**Spanish Government, **ongoing**) Integrated Management of Sustainable Agrosystems"; LANDSUPPORT **(**Horizon 2020, 2018-2022) Development of Integrated Web-Based Land Decision Support System Aiming Towards the Implementation of Policies for Agriculture and Environment; **PACE-ISOTEC** (Spanish Government, 2018-2021) Attenuation processes of conventional and emerging contaminants from agricultural and industrial sources in waters; **INCIPIT (**PRIN 2019, **ongoing**) INtegrated Computer modeling and monitoring for Irrigation Planning in ITaly); **KNOW** (RAS 2010-2015) Implementing the Knowledge of Nitrogen in Groundwater; **REMEDIATION** (Spanish Government, 2015-2017) Water pollution remediation strategies based on the optimization of natural attenuation processes; **SALTFREE** (ARIMNET2 - FP7 2014-2017) Salinization in irrigated areas: risk evaluation and prevention
Collaborations will be created with 1) the other projects funded under this same topic, and 2) projects funded under other programs related to the topic of NPP-SOL such as e.g. project funded under Topic LC-GD-6-1-2020 - Subtopic: "Reducing the dependence on hazardous pesticides; reducing the losses of nutrients from fertilisers, towards zero pollution of water, soil and air and ultimately fertiliser use." NPP-SOL will seek synergies with active research activities recognized by the JRCs, and will organize joint matchmaking meetings and events to boost the exchange of knowledge and information among relevant projects, and open research collaborations with the scientific community as a whole. This cross-collaboration will stimulate joint research and innovation activities and will contribute to the challenges set out in the **European Green Deal**, the **Soil Deal for Europe**, the **Farm to Fork Strategy**, and the **UN SDG 6** - Clean water and sanitation. Moreover, the interdisciplinary collaboration will be crucial for the NPP-SOL activities related to the Scaling Out of the solutions developed within the NPP-SOL framework (see Task 1.3 in the WP1 below).

(b) Methodology

1.3.4 Overall methodology, activities flow and case studies

The proposed methodology is organised into **laboratory and field scale research activities** based on the integration of research and innovative activities, included with a deep analysis of the local environment conditions that drive the final technological solutions and the proposal of good practices, through a participative approach. In designing the NPP-SOL project, we have chosen a straightforward structure, with the number of WPs reduced to the essentials. The well-defined objectives of NPP-SOL require a limited number of activities but with dense scientific content. This allowed us to clearly identify who has to do what, thus avoiding intricate, and sometimes incomprehensible, cross-links between WPs. For us, this is a project's strength: simple, well-defined activities but with high-density research content, both at the basic and

application level. Accordingly, the Deliverables of each WP and the Milestones will be intentionally limited to the essential, to guarantee their actual accomplishment.
The first activities of the project will be the ones in **WP1** *Co-Creation, Scaling Up, Scaling Out*. **WP1 sets the foundation for the implementation of the scientific-technical activities of NPP-SOL.** At the core of this WP is the creation and governance of an open group of stakeholders and researchers, called **SHR-HUB (HUB of the Stakeholders Entities and Researchers)**. The SHR-HUB will be the HUB of the project, (i) providing continuous updates on the evolving needs and problems to be solved in each study area; (ii) receiving and processing the results from the technical WPs; (iii) orienting the modelling conceptualisations, scenarios and methodologies for the development of the SSBMP; and (iv) providing new inputs to reshape the design and/or operational parameters of the PPTs. The SHR-HUB will be physically settled at the CIHEAM-IAM and will include four sub-units called *living-hubs*, one for each case study, which will guarantee a continuous interaction among consortium partner researchers and SEs about PPT and SSBMP to be developed in the specific case study. The four living-hubs will interact regularly through the SHR-HUB (see the Task 1.1. in the WP1 below). In the context of NPP-SOL, Scaling Up has to be thought of as spreading the PPTs and SSBMP from the study area size to the whole polluted area. For example, the BR will be developed at a farm scale in the Arborea Plain, Italy. Scaling Up will extend the PPT application to approximately 5000 ha of the Arborea polluted area. In this sense, Scaling Up does not involve enlarging the size of the developed technology but rather the area where the small and medium-scale PPTs have to be replicated. By contrast, Scaling Out activities will analyse the possibilities to extend the PPt and the SSBMP from the study sites to other areas with similar physical-hydrological contexts and/or other study sites involved in NPP-SOL.
WP2 *Technologies Development and Improvement* and **WP3** *Experimental Tests and Data Collection* will be set up for each Case Studies. The exchange of information among CS will be guaranteed by the WP1, which collect all the data from all the case studies and propose suggestions and solutions to improve PPTs and SSBMP, eventually extending PPTs and SSBMP to other partners. In other words, separating the activities in the WP2 and WP3 for each CS will not limit at all the opportunity of crossing information to find synergies in the combination of different PPTs and SSBMP. **WP4** *Modeling for technologies optimization, Modeling for Best Practices* will develop the MT, by integrating FLOWS-HAGES and DAHBSIM models. MT will support developing and designing of PPTs and SSBMP for each case study. All the information coming from the WP2, WP3 and WP4 will be passed to the WP1 for discussion with SE about technical, operative and economic feasibility and their acceptance by the farmer communities. Feedbacks from WP1 will come again to WP4 and from this to WP2 and WP3, in an **iterative process** aiming to co-designing the SSBMP and PPTs. At the end of this "**optimization process**", the SE, strictly involved in the WP1, will have available the tools for Scaling Up the SSBMP and PPT on the whole polluted area of each CS. WP1 will also evaluate the possibility of transferring (Scaling Out) the SSBMP and PPT developed in a CS to other areas with similar problems and physical contexts, and/or even to the other CS areas involved in NPP-SOL.
The project's outputs, outcomes, and impacts will be disseminated and communicated, supported by all partners' experience, expertise, and networks, in **WP5**. The aim is to build the capacity of the multiple stakeholders through workshops, training with demonstration (learning-by-seeing and learning-by-doing), focus groups, and meetings to discuss the socio-economic, agro-ecological, and governance matters related to the interventions. This action will illustrate certain convincing results of the interventions, share individual or collective decision-making results, and promote the communication (transfer) of scientific knowledge and dissemination of outcomes from all the project activities to increase stakeholder adoption of these interventions.

NPP-SOL project will be implemented in four **Case Studies (CS)** located in 4 Mediterranean countries: **Israel, Italy, Morocco and Spain.** In all the test sites, preliminary activities will consist of analysing the Pollutant Sources Analysis (**PSA**) of NPS pollutants (mostly involving UB and UNICA), as well as the dominant actual soil, water, fertilizers and crop farm practices (mostly involving UNIBAS, ARO, MOAG, INRA, UM5, CIHEAM-IAM). Thus, **MT** (coming from UNIBAS and CIHEAM-IAM) will be used to identify **SSBMP** aiming to attenuate NPS pollutants production and transport to water bodies, and to support the designing and optimization of the site-specific **PPT**. The bioeconomic component of the MT (CIHEAM-IAM) will allow evaluating cost-benefits related to both SSBMP and PPT. The **Co-Testing (CT)** phase (involving all the partners and the SEs) is pivotal in the project, as it will validate the technical-economic feasibility of the SSBMP and PPT in each specific environmental, social and economic context considered in the project. The economic performance of the SSBMP and PPT, co-designed with local stakeholders, will be optimised by using the bio-economic component of the MT. Furthermore, the CT phase will transfer the technical operability of SSBMP and PPT to technicians (**TCB**). The CT phase guarantees Farmers Awareness (**FA**) in the environmental issues related to their farming activities and, connected to this, spreading the SSBMP and PPT

to the whole NPS polluted area. SSBMP and small-to-medium scale PPT will be designed, based on site-specific hydrological regime, agronomic practices, crops, climate etc.

The following figure provides a schematic view of the proposal **activities flow:**

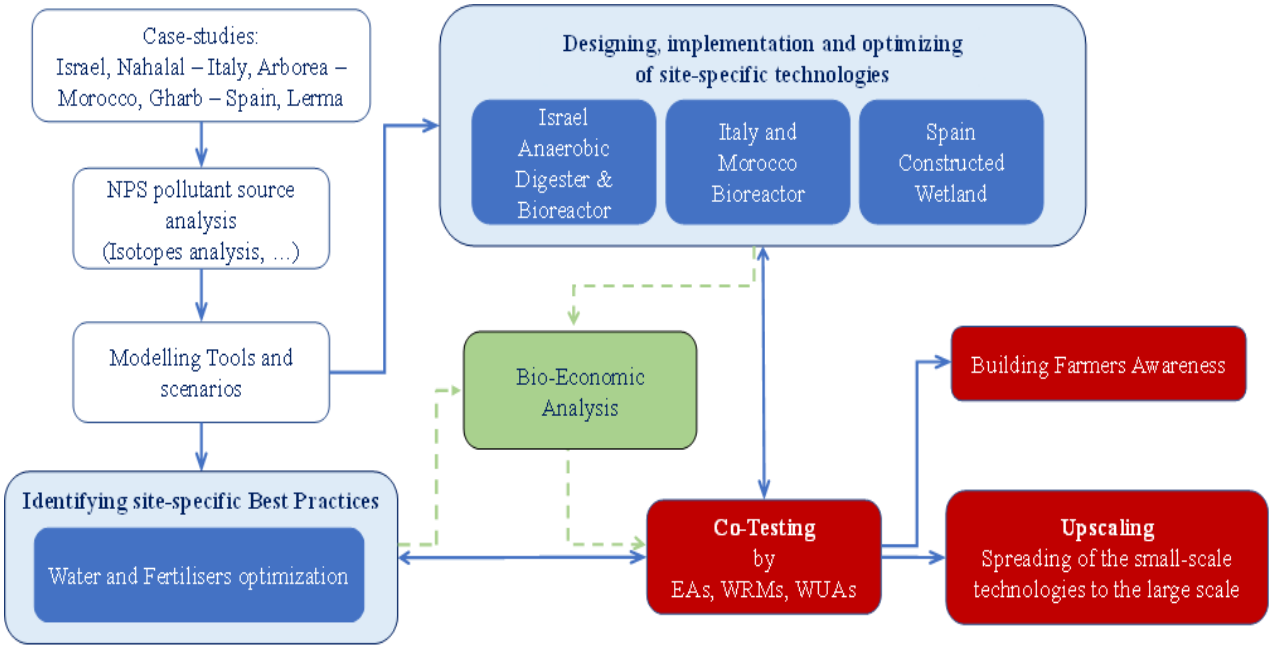

Figure 1.1. Flow of activities to be carried out in the project

The following table gives details on the **physical-hydrological, hydrogeological and agronomic characteristics of the four CS**:

Case Study	Agricultural Watershed (area in ha)	Mean Annual Rainfall (mm)	Soil prevailing in the Case Study	Aquifer	Water table depth	Field Crops	Irrigation Water Source
ISRAEL	Nahalal Stream	570	Typic Chromoxerets Vertisol of alluvial origin	Shallow aquifer of Yezre'el valley	1-2 m	Rotational Crops: Maize, Sunflower, Wheat, Cotton	Rainfed; Irrigation from Treated Wate Reservoir
ITALY	Arborea Plain (5000)	640	Dystric Xeropsamment (sandy soils coming from sand dunes	Sandy hydrogeological unit	1-2 m	Rotational Crops: Maize, Ryegrass, alfa-alfa	Irrigation from Arborea Dam
MOROCCO	Gharb irrigated area	500	Vertisol	Gharb free superficial aquifer and semi-confined deep aquifer	2-8 m	Cereals, Citrus, Fodder, Vegetables	Irrigation from Oued Sebou and Idriss 1er Dam
SPAIN	Lerma basin (750 ha), part of Arba River Basin	400	Calcixerolls (Calcixerollic Xerochrepts)	Perched aquifers in Quaternary glacis (max 12m thickness) consisting of gravels with loamy matrix	variable but very shallow (maximum thickness of the perched aquifers is 12m)	Maize, winter cereals (wheat, barley), tomatoes, peas, sunflower	Irrigation from Yesa reservoir (Aragon River)

Table 1.3 Physical-hydrological, hydrogeological and agronomic characteristics of the project Case Studies

The following figure shows the site locations along with related main pollution issues and schematic view of the specific PPTs to be developed within NPP-SOL.

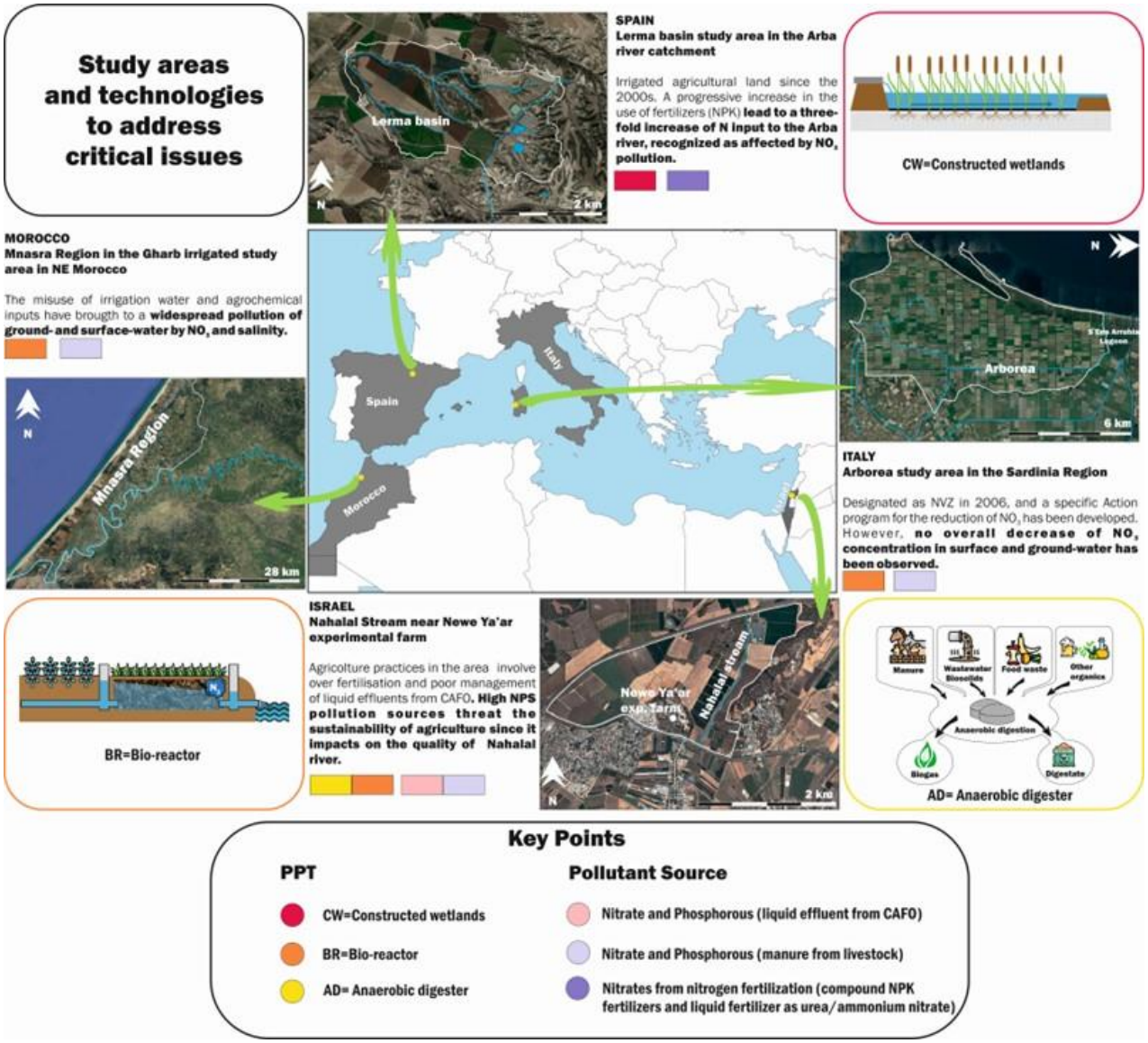

Figure 1.2. CS location, their main pollution issues and schematic view of the specific NPP-SOL PPT.

More details for each **CS** are given below.

Israel: Area of the Nahalal stream restoration project, near Newe Ya'ar experimental farm. In the area, there is a tendency to over fertilise. Untreated manure and liquid effluents from a Concentrated Animal Feeding Operation (CAFO) is a major PS pollution source in that area that challenges sustainability in the interface between Nahalal stream and the agricultural activity. In this project, farm-scale AD will be set up to improve river/farm interface by adopting decentralised agricultural waste management practices. AD that will be integrated with a post-treatment to the liquid digestate (by either biofiltration or hydrothermal carbonization), will eventually minimise the NPS pollution by CAFO. In addition to energy recovery (as biogas by AD), a process integration will provide an added value by recovering nitrogen and phosphorus for fertilisation and soil amendment. Furthermore, BR will be installed at the buffer strip between the agricultural fields and the stream, in the area where gullies connect to the main channel and transfer large loads of excess nutrients.

Italy: Arborea Plain - Sardinia Region. This is a hydraulic reclamation area, where animal manure and slurry, as well as synthetic nitrogen fertilizers, have been applied on the fields. This has resulted in high nitrate concentrations, especially in the shallow aquifer. Besides the groundwater, nitrates and phosphates are also lost directly by surface runoff to the reclamation channels network ending to the S'Ena Arrubia natural wetland, which is an EU recognized naturalistic site. The area is under the management of the Oristano Land

Reclamation and Irrigation Consortium involved in this project as one of the main stakeholders. In this project, farm-scale BR (serving an area of about 15 ha) will be set up. The drainage water from the artificial drainage network and the runoff will be conveyed to the BR before being delivered to drainage reclamation channels.

***Morocco**:* Gharb irrigated area. It is an alluvial plain located in the Northwest of Morocco. Soils are mainly sandy and clayey soil. Agriculture and livestock are the main economic activities. Many studies have reported the pollution of the surface and groundwater by nitrates and salinity. The deterioration of water resources quality is mostly due to the misuse of irrigation water and agro-chemical inputs. To prevent negative effects of salinity on soil and crops, innovative farming practices will be adopted, such as irrigation by treated water (e.g. magnetized water). Moreover, the site will be important to identify possible trade-offs between the need to leach salts by excess irrigation water and preserving groundwater from salts and nutrients. Accordingly, as for Italy, farm-scale BR will be set up where the water from the irrigated fields through artificial tile drainage, containing salts and nitrates, will be conveyed for denitrification before discharge.

***Spain**:* Arba River Basin, located on the left bank of the middle Ebro River Valley (Zaragoza, north-east Spain). Here, in the 2000s, approximately 20,000 ha of rainfed croplands were transformed into irrigated agricultural land, leading to a progressive increase in the use of fertilizers in the area (compound and liquid NPK fertilizers). A small watershed representative of the area (Lerma basin, 733 ha) has been monitored since 2004 to assess the effects of this transformation on the water balance and the salt and NO_3^--N exports. In general, the implementation of irrigation implied a three-fold increase in N export to the receiving Arba River, which was the first surface water body in the Ebro River Basin to be declared affected by NO_3^- pollution according to the Nitrates Directive 91/676/EEC. In this project, a Nature Based Solution consisting in a surface flow CW will be adopted in order to diminish the release of NO_3^- from the Lerma basin to the Arba River.

1.3.5 NPP-SOL site-tailored and affordable-costs solutions

NPP-SOL will develop in situ low cost, bioremediation and **nature-based solutions** aiming to **intercept** and **remove** NPS pollutants before they reach the groundwater and surface water bodies.
Specifically, and described below: **Modelling Tools** to provide quantitative predictions of NPS pollutant transport**; Pollution-Preventing Technologies,** such as **Bioreactors (BR)** and a **Constructed Wetland (CW)** to remove nutrients (and pesticides) from surface runoff and/or drainage water coming from agricultural fields, and **Anaerobic Digestors (AD)** to preliminary treat livestock slurries before they are spread to the soil. **Technical Capacity Building** and **Farmers Awareness** activities are equally planned and provided to ensure a fair application of these solutions.

Modelling Tools (MT): NPP-SOL integrates an agro-hydrological model, the **FLOWS-HAGES** (FLOws of Water and Solute Transport in Heterogeneous Agricultural and Environmental Systems) and a bio-economic model, the **DAHBSIM** (Dynamic Agricultural Household Bio-economic SImulation Model)[6] to obtain and make available quantitative transport projections of NPS pollutants.
FLOWS-HAGES is a Dynamic Physically-Based model solving the Richards equation (RE) for water flow and the Advection Dispersion equation (ADE) for solute transport, including non-linear adsorption and other non-linear processes. The model produces information on the time evolution of water and solutes balance and, specifically, of all the functional processes involved (namely, evapotranspiration, root uptake of water and solutes, irrigation volumes, groundwater recharge, drainage, runoff, and nutrient transport). As for solute transport, the model allows for **salts, pesticides, phosphorus and nitrogen transport simulations**. In the case of nitrogen transport, the model accounts for several forms (both organic and mineral) of nitrogen fertilizers: 1) Manure; 2) Cover crops; 3) Urea; 4) N-NH4 and N-NO3 solid and liquid fertilizers. Furthermore, the model allows nitrification, denitrification and immobilization coefficients to be given node by node in the simulation domain. The model also describes the solute flow in **the gaseous phase**, essential for **pesticide transport simulations**.
DAHBSIM **maximizes household objectives** subject to constraints and resources allocation patterns by linking a number of sub-modules related to economic, production (including livestock), and consumption decisions. It is a dynamic model, where agricultural technology is explicitly represented using the engineering production coefficients generated by the DAHBSIM crop module. It allows e.g. to consider all types of crop and livestock management activities, as well as on-farm processing and marketing activities, with data

[6] El Ansari et al., 2002. Intensification options in cereal-legume production systems generate trade-offs between sustainability pillars for smallholder farmers in northern Morocco. Land use policy.

collected by the farm survey. It can **assess the performances for a wide range of farm types** differing in (i) resource endowments (land, labour, equipment availability); (ii) production intensity (i.e. output per hectare); (iii) specialisation (arable, livestock, mixed); (iv) biophysical conditions (soil, weather); (v) land use (grassland, annual crops, perennial crops, agro-forestry); (vi) farm management (organic, conventional, integrated); (vii) production orientation (market, self-consumption); (viii) socio-economic contexts (CAP reform, water policy, agri-environmental policies), and is especially suitable to describe the diversity of agricultural systems across the Mediterranean region.
Integrating FLOWS-HAGES and DAHBSIM, the MT can support SSBMP development and provide the information needed to design and develop the PPT to be applied to prevent water pollution, along with the related guidelines for their optimal management even beyond the project's lifespan.

Pollution-Preventing Technologies (PPT): Among the available technological tools for preventing nutrient release to water bodies, NPP-SOL will implement **Bioreactors, Constructed Wetland** and **Anaerobic Digestion** in operational environment (TRL 6-7). Namely:

1. *Bioreactors (BR)*: (To be set up in the Israeli, Italian and Moroccan CS) - BR are passive treatment systems that can be used to prevent both surface runoff and groundwater pollution. The proposed technology allows for a progressive reduction (in the medium term) of the nitrate, phosphorus (and even pesticides) concentrations in the ground and surface waters through the (partial) interception of the percolation and /or runoff flows of water and dissolved pollutants through a drainage system. With these systems, the reduction of nitrates and phosphorus may be obtained by making part of the drainage and/or runoff volumes flow through an artificial porous medium containing woodchips (high C:N) ratio (for heterotrophic denitrification process), mixed with activated alumina/gravel mixture (for phosphate precipitation and complexation). Biochar-amended BR are also able to remove pesticides. In this project, farm-scale BR (serving an area of about 10-15 ha) will be set up. The drainage water coming from the artificial drainage network, as well as the runoff, will be partly conveyed to the BR before being delivered to drainage reclamation channels.

2. *Constructed Wetlands (CW)*: (To be set up in the Spanish CS) - CW are low cost, promising nature-based solution systems specifically designed to remove diverse pollutants from water by using mostly the processes that occur in natural wetlands, but within a more controlled environment. Denitrification is generally considered to be the major NO_3^- removal process in CW[7]. The nutrients reduction processes in the CW are similar to those in the BR. Additionally, CW can also be useful for the removal of other contaminants, such as pesticides, pharmaceuticals, etc. In this project, a CW will be adopted aiming to attenuate the release of NO_3^- from the Lerma Basin to the Arba River. The surface water of the Lerma gully, polluted by the agricultural return flows (namely, the Lerma gully is feeded by local shallow perched aquifers contaminated by agricultural return flows), will be partially diverted towards the CW, to be afterwards given back to the gully after the treatment. The system will rely on: i) Surface CW: 50% of aerobic zone with emergent macrophytes (Typha and Phragmites), working as natural green filter;ii) Subsurface CW: 50% area filled with gravel, where higher nutrients removal efficiency is expected because of prevailing anoxic conditions. Local wine and dairy industry by-products will be tested at laboratory and field scale as cost-effective and sustainable electron donor supplies to promote heterotrophic denitrification.

3. *Anaerobic Digesters (AD)*: (To be set up in the Israeli CS) - Anaerobic digestion of manure is an on-farm technology using a microbe-mediated process in the absence of oxygen breaking complex organic compounds in the manure into simpler compounds. The process produces biogas, which can be used as an energy source to run combined heat and power systems for generating electricity. Anaerobic digestate, both in liquid and solid forms, are also produced. It contains higher mineralized fractions of N and P, which can be recycled back to fields for crop nutrient needs. The solid digestate can also be used as livestock bedding or sold as horticultural potting mix because of its high fibre content. AD, coupled with a digestate post-treatment allows to minimise the NPS pollution by CAFO. In addition, an efficient process integration will provide a recovery of both nitrogen and phosphorus for fertilisation and soil amendment. Compared to BR and partly to CW, AD involves more costly technologies. However, they allow for recovering energy and nutrients, which is a key to a **circular economy** that minimises intensive agriculture's carbon footprint and empowers ecosystem services.

[7] Margalef-Marti et al., 2019a. Feasibility of using rural waste products to increase the denitrification efficiency in a surface flow constructed wetland. Journal of Hydrology, 578, 124035. DOI: 10.1016/j.jhydrol.2019.124035); Agric. Ecosyst. Environ. 133, 103–113. https://doi.org/10.1016/j.agee.2009.05.007.

Box 1.1 Economic and Operative Strengths of PPT

Common to BR and CW is the high transferability to developing countries due to their simplicity of the operating principle, which has an important impact in economic terms. In addition, they require relatively low maintenance, operating costs and energy requirements, as they are fed by exploiting the hydraulic gradients naturally present through the drainage system. In general, the costs are limited to a few thousand euros[8].Compared to other types of treatment that involves the treatment of already polluted water (e.g. inverse osmosis), the interception of pollutants flows by BR and CW allows to solve the problem before the pollutant propagates to the groundwater and the surface water, thus significantly reducing the volumes to be treated for water remediation.

Similar to BR and CW, AD are still small-to-medium scale technologies where farmers are responsible for and they can see the effects of adopting sustainable and environmentally sound agricultural practices in livestock production systems and integrated farms.

The monitoring systems adopted in the PPT will allow the farmer to verify the effectiveness of the irrigation and fertilization techniques adopted on the basis of the pollutants loads that arrive over time to the BR and CW, and to possibly adopt corrective measures in the management of water and nutrients.

Box 1.2 Hydrochemical characterization of the CS sites

Hydrochemical characterization and multi-isotopic tools will be used for evaluating the efficiency of the on-site denitrification strategy. Looking for their best design and management, the BR and CW will be equipped with appropriate monitoring tools within the system, as well as at its entrance and exit. On one hand, these monitoring tools will serve to establish the actual source of the pollutants in the water to be treated, and to trace the efficiency of the treatment.

As for nitrogen, in this project chemical and isotopic characterization will be applied to understand and support the evaluation of the efficiency of the bioremediation strategies[9] and to trace the naturally occurring NO_3 transformation processes[10]. During denitrification, the unreacted residual NO_3 becomes enriched in the heavy isotopes 15N and 18O, distinguishing the biological attenuation from other processes, such as dilution due to non-polluted water inputs (e.g., from rainfall), that could also lead to a concentration decrease without influencing the isotopic signature.

Box 1.3. MT as a link between PPT and SSBMP

SSBMP and PPT are not thought to work independently but rather in a **virtuous sequence** where SSBMP will look for minimising the pollutant loads to be treated by PPT. In this sense, by analysing different alternative scenarios, the MT will identify the best management options of water and agro-chemicals (timing, quantities, application splitting), as well as of agronomic practices (tillage, crop rotations, organic matter content) to minimise the pollutant mass into water leaving agricultural fields and flowing to the surface and groundwater bodies, still maintaining profitable farmer activities. MT will also provide the technical information (estimations of water fluxes and pollutant masses to be treated, residence time, hydraulic gradients, etc.) to design and develop the PPT aiming to finalise the abatement of the pollutants already attenuated by the SSBMP. SSBMP will be strictly related to the CS, so that the same PPT could require different BMP depending on the physical context where PPT have to be developed. In PPT designing, SSBMS will be further adjusted looking for PPT operativity optimization. WP4 will provide all the guidelines for optimal management coming from modelling results.

[8] Christianson et al., 2013. Financial comparison of seven nitrate reduction strategies for Midwestern agricultural drainage. Water Resources and Economics, 2-3(2013)30–56 3.

[9] Biddau et al., 2019. Source and fate of nitrate in contaminated groundwater systems: Assessing spatial and temporal variations by hydrogeochemistry and multiple stable isotope tools. Science of the Total Environment, 647, pp. 1121-1136; Pittalis et al., 2018. Hydrogeological and multi-isotopic approach to define nitrate pollution and denitrification processes in a coastal aquifer (Sardinia, Italy) Hydrogeology Journal, 26 (6), pp. 2021-2040; Margalef-Marti et al., 2019b. Evaluating the potential use of a dairy industry residue to induce denitrification in polluted water bodies: a flowthrough experiment. J. Environ. Manage. 245. https://doi.org/10.1016/j.jenvman.2019.03.086.

[10] Otero et al.,. Monitoring groundwater nitrate attenuation in a regional system coupling hydrogeology with multi-isotopic methods: the case of Plana de Vic (Osona, Spain).

The following table gives details on the four CS along with the **pollution sources and the polluted water bodies**, as well as the **PPT to be developed** and their size and scale of application:

Case Study	PPT	Scale of the PPT and size (ha)	Area served by the PPT (ha)	Pollutant (Source)	Contaminated Water body
ISRAEL	AD	Field (0.1)	1	Nitrates and Phosphorus (liquid effluent from CAFO)	Surface and Groundwater
	BR	Field (0.01)	10-15	nitrates and Phosphorus (manure from livestock)	Surface and Groundwater
ITALY	BR	Field (0.01)	10-15	Nitrates and Phosphorus (manure from livestock)	Surface and Groundwater
MOROCCO	BR	Field (0.01)	10-15	Nitrates and Phosphorus (manure from livestock)	Surface and Groundwater
SPAIN	CW	Field (0.25)	700	Nitrates from nitrogen fertilization (compound NPK fertilizers and liquid fertilizer as urea/ammonium nitrate)	Surface water (objective of the PPTs in the Lerma basin) + shallow Groundwater (shallow perched aquifers contaminated by the agricultural return flows, and which feed the Lerma gully)

Table 1.3. NPP-SOL PPT and their size and scale of application.

Technical Capacity Building (TCB) and Farmers Awareness (FA): Capacity building will be devoted to the training of WUA, regional and national EA technicians, and WRM, who will have the role of supporting farmers beyond the project duration.
Specifically, **technical training** will be directed to (for details, see Task 5.5 in the WP5):

- Modelling;
- Maintenance and technical regulation of PPT;
- Involvement and assistance to farmers.

The TCB and FA activities' overall goal is to guarantee the sustainability of the modelling and technological tools in the long run by building a self-sustaining capacity inside WUA, EA and WRM.

1.3.6 Gender dimension

NPP-SOL project intends to be aligned with the ambitions of the EU on gender issues underlined in the **Gender Equality Strategy 2020-2025**. Therefore, the project will ensure equal opportunities between men and women as a fundamental value by balancing representation in management, project meetings and events, outreach activities, and research. **The Gender Equality Plan (GEP)** adopted by the European partners indicates actions and activities to be developed to promote the gender dimension in all forms within the project. All project partners will be challenged to adopt new and valuable actions to better promote the gender inclusion, to implement innovative strategies to correct any bias and to set targets and monitoring progress via indicators.

1.4 Ambition

So far, in order to preserve water resources and in general the environment, a top-down approach has generally been used, with a variety of mandatory regulatory tools that farmers have to comply with for addressing NPS pollution from agricultural sources. Such a top-down strategy is obviously easy to administer compared to site-specific tailored approaches, but has proven to be highly ineffective. Actually, trends in the chemical quality of many groundwater and surface water bodies demonstrates the failure of the actions taken for their remediation.

Based on these evidences, NPP-SOL aims to provide and foster the adoption of the **site-specific best management practices for improving soil, water, fertilizers and crop management** and of **site-tailored and affordable-costs technologies** for **preventing natural bodies pollution** in the **MED region**.
The NPP-SOL consortium strongly believes that the most effective mechanism for maximizing the expected impacts is to maintain a constant dialogue with stakeholders, experts, policy makers and the research community that allows a constant and indispensable up-take of their inputs in terms of perceptions and recommendations as well as and the validation and the transfer of project results.
The ambition of NPP-SOL is manifold:
1. Reversing the traditional top-down approach, **looking for more site-specific approaches, more oriented to support farmers** rather than sanctioning and limiting their entrepreneurship. This would actually represent a ground-breaking objective, for maintaining the trade-off between the needs of sustaining farmers' income and detrimental environmental impacts of NPS pollutants.
2. **Privileging small-to-medium scale PPT**, to be spread over the whole agricultural basin, and avoiding big-sized interventions, **so making the farmers closely involved and directly accountable for the management practices applied in their farm**, as they may immediately perceive the impacts of adopting alternative agricultural practices on the quality of the water leaving the cultivated fields to the surface or groundwater.
3. **Developing PPT mostly oriented to enhancing circular economy**, by directly using materials available on farm or agri-food industry (e.g. BR and CW) or even by recuperating nutrients from pollutant sources (e.g. AD).
4. **Guaranteeing the sustainability of the PPT in the long run**, by building a self-sustaining capacity inside WUA, EA and WRM. In this direction, PPT have also to be relatively simple to operate and regulate, with low maintenance and management costs.

2. Impact

2.1 Expected impacts

The expected impacts of NPP-SOL will contribute to the implementation of the **expected outputs and outcomes indicated in the PRIMA-SRIA**. The project contributes to the **SRIA priorities** 1.1 Water resources availability and quality within catchments and aquifers and 2.2 Developing sustainable and productive agro-ecosystems. Specifically, it contributes to the **expected impacts** listed in the work programme under the **Topic 2.1.1 RIA Prevent and reduce land and water salinization and pollution due to agri-food activities**.
The table below summarises the more relevant **NPP-SOL outputs and their KPIs** in relation to each of the **expected impacts of the Topic**.

Expected Impacts from Topic 2.1.1	**NPP-SOL Outputs**	**KPIs NPP-SOL outputs**
Reduction in the contamination and salinization of water bodies by agri-food practices upscaling results from the farm to the whole water basin area considering the different **sources of water contamination related to the agri-food activities**	- A suite of co-designed SSBMP and PPT - A suite of MT provided - A preliminary Co-Testing activity to validate the technical-economic feasibility of NPP-SOL outputs in different scenarios - A mapping of stakeholders' needs and key challenges - A suite of co-designed technical trainings - Innovative dissemination and engagement methods - Scientific reports and papers	- n° > 8 of SSBMP and related guidelines; - n° 5 of PPT and related guidelines; - n° 1 MT Software integrating FLOWS-HAGES and DAHBSIM models; - n° 3 MT Software Handbooks; - n° 14 of WRM, EA and WUA involved in the Co-Testing; - n° > 30 of technicians trained - n° > 30 of farmers involved in dissemination activities; - n° > 4 of living-hubs meetings; n° > 4 of peer review articles.
Development of a **site-specific solution to reduce nitrate leaching** under specific Mediterranean soil conditions (i.e. salinity and sodicity)	- SSBMPs prevent losses of nitrates to both surface (by runoff) and groundwater (by deep percolation) - BRs and CWs intercept and remove nitrates (and phosphates) before they reach the final natural receiving water bodies;	- n° > 8 of SSBMP and related guidelines; - n° of BR (3) and CW (1) to remove nitrates in each case study; - n° of AD (1), BF (1) and HTC (1) to treat manure;

	- AD and digestate treatment by BF or HTC minimise the NPS pollution of water bodies; - Under soil and water saline conditions, BRs manage the leaching of salts while limiting nutrient losses to groundwater.	- Efficiency of BR and CW (Fraction of nutrient mass removed from water fluxes coming from the cultivated fields to the surface and groundwater); - Efficiency of AD (and connected BF/HTC) (Fraction of manure treated)
Evaluation of the risks linked to **pesticides** and other **potential organic pollutants** use on water and soil contamination and rehabilitation of polluted soils and water	- FLOWS-HAGES model establishes the travel times and mass fluxes of any solutes (even pesticides and other organic pollutants) applied by the farmer to the groundwater, runoff, and artificial drainage systems. - NPP-SOL tests biochar-amended BR to remove pesticides from both runoff and deep percolation water.	-n° 1 of BR to remove pesticides; -Efficiency of PPT (Fraction of pesticide mass removed from water fluxes coming from the cultivated fields to the surface and groundwater);
The development and on-site application of **innovative and environmental-friendly technical solutions** for water decontamination	- Co-design site-specific SSBMP - Easy-to-use PPTs - MT user-friendly interface - Easy-to-read manuals and guidelines for farmers - Assessment of the socio-economic and environmental performance of the representative/selected farms - Co-design PPT drives producers to adopt environmentally-friendly farming practices in livestock management, allowing energy and nutrient recovery	- n° > 4 of living-hubs meetings; - n° 7 of manuals and guidelines for farmers; - n° 14 of WRM, EA and WUA involved in the Co-Testing; - n°3 of MT Software easy-handbooks; - n°4 of PPT guidelines; - n°4 of training with demonstration.

Table 2.1 NPP-SOL outputs and its KPIs in relation to the Topic expected impacts

2.2 Measures to maximize impact

a) Dissemination and exploitation of results & b) Communication activities

CIHEAM-IAM, as WP5 leader, in close collaboration with the entire consortium, will take care of the communication of the project with the aim of raising awareness and enhance interest in NPP-SOL to various target groups and of the **dissemination and exploitation of results** achieved throughout NPP-SOL implementation period thanks to the realisation of the ***Outward Strategy*** (see Task 1 in WP5). This document address the following objectives: **i)** Target specific audiences that will benefit from project's results and trigger them to adopt new sustainable agro-hydrological approaches in farming systems; **ii)** Identify next steps for further actions to support SE and farmers in the adoption of the tools, technologies and agro-hydrogeological practices developed by the project; **iii)** Plan, design, implement, monitor and evaluate a set of dissemination and communication activities; **iv)** Increase the awareness about the project activities, results and conclusions.
Fully embedded in the project's structure, CIHEAM-IAM is an international organization with vast expertise in communication and dissemination activities with stakeholders; organization of capacity development programmes training and workshops.
The dissemination (D) and communication (C) activities, involving all partners (adequate efforts and budget was foreseen), will start from the very beginning of the project and they will involve a large amount of stakeholders and contacts thanks to the NPP-SOL partners' networks, contacts and databases with the aim of enlarging project's network and foster participation in NPP-SOL activities. Networking and cooperation with other research consortia, thematic living labs and groups, innovation projects conducting similar research in the Mediterranean region, as well as the policymakers engagement will be central.

Target groups:
a. Primary target audience (TG1), **NPP-SOL SE**[11] and others **Water Users Associations;**
b. Secondary target audience (TG2), **Farmers and local associations;**
c. Scientific target audience (TG3), **Academia**;
d. Institutional target audience (TG4), **National authorities, decision makers, policy makers (beyond NPP-SOL SE) and funders**;
e. (TG5), **Civil society.**

The ***Outward Strategy*** (see Task 1 in WP5) will be drafted at the beginning of the project and later updated. For each of the different identified target groups of the NPP-SOL project, the *Strategy* will include: (i) communication objectives (WHY), (ii) target (WHO), (iii) messages (WHAT), (iv) tools (HOW) and (iv) agent, time and location of the activities (BY WHOM, WHEN and WHERE). Moreover, the *Outward Strategy* will establish all the indicators and the measures to monitor and evaluate the success of the dissemination and communication activities. The core elements of the *Strategy* are summarised in the table below:

<table>
<tr><td colspan="3">WHY? What is the purpose of the dissemination and communication activity? What are the objectives of the dissemination and exploitation plan?</td></tr>
<tr><td>WHO?</td><td>WHAT?</td><td>HOW?</td></tr>
<tr><td>Who is the targeted audience</td><td>What information should be delivered</td><td rowspan="2">Mechanisms and tools envisaged in the strategy:
· Project website,
· Social Media,
· Events,
· Summer Schools etc.</td></tr>
<tr><td>Who should be involved in communication processes</td><td>Each stakeholder and target group relevant for the project may have different information requirements</td></tr>
<tr><td>WHEN?</td><td>BY WHOM?</td><td>WHERE?</td></tr>
<tr><td>NPP-SOL partners will ensure the timing of the dissemination activities are effective. Projects key activities, outputs and milestones will be accompanied by the relevant communication activities.</td><td>The Strategy will detail each communication and dissemination task of the project and will assign clear responsibility to specific partners. It will be updated regularly during the implementation of the project.</td><td>The location of communication activities is also important. Target audiences should be reached wherever they are and at all relevant levels (local, regional, EU and beyond).</td></tr>
</table>

Table 2.2 Matrix for the NPP-SOL Outward Strategy

With the aim of enhancing the visibility of the project and maximize its impacts, all communication and dissemination activities will be targeted according to the specificity of the audience. A series of specific communication activities is presented in the table below, with the indication of target groups and **KPIs**, aiming to assess the communication effectiveness. The formats, language and focus of the communication and dissemination products will be shaped according to the different communities of users.

Tool description and purpose (D/C) & timing (from M1 to M36)	Target	KPIs
Website (D/C): It will be set-up at the beginning of the project and kept updated with news, events, public deliverables, scientific publications and the material used in the events where the project is presented (such as slides, videos, etc.) – acting also as dissemination tools. **(M4 -M36)**	TG1, TG2, TG3, TG4, TG5	- Number of unique visitors to the Website: **10.000**

[11] In the D&C plan, SE already engaged in the NPP-SOL drafting (Table 1.2), are equally considered as target group and co-designers of the activities.

Presentations at EC events, exchanges with other projects, communication through EC media and channels (D/C): The project will be disseminated through activities, networks or meetings with EC, other initiatives and similar funded projects. The involvement of the European Enterprise Network (EEN) will be crucial. **(M1 – M36)**	TG1, TG2, TG3, TG4	- Collaboration/demo with similar projects, meetings with NCPs and other networks: **at least 20**
Events and meetings (D/C): SHR-HUB co-creation events will be held aiming at: **i)** validation of results; **ii)** define the recommendations emerging from the four living-hubs and project's outputs. A final conference to present project's results will be organized **(M6 – M36)**	TG1, TG2, TG3, TG4, TG5	- Co-created SHR-HUB workshops: **at least 4** - Stakeholders: **>100;** Stakeholder involved at the NPP-SOL Final conference: >**50**
Communication kit (C): A recognizable project identity will increase awareness about NPP-SOL, with the creation of communication materials. *All the printable materials will be printed if strictly necessary, in line with the SDGs*. Videos and infographics will be produced to communicate concept and results to a wider public **(M1 – M6 - update and upgrade M18 and M34)**	TG1, TG2, TG3, TG4, TG5	- Leaflets (at least 5 languages): **<10.000** - Posters: **at least 5;** Promotional video: **1** -Infographics produced: **at least 4**
Social networks (SNs) (C): Information will be built considering the SNs technical requirements and disseminated in SNs partners' channels. To maximise engagement and raise awareness through an already built community, these online activities will be shared on all the consortium's SNs. **(M1 – M36)**	TG1, TG2, TG3, TG4, TG5	- Nr. of followers among all social networks: **2.000** - Nr. of posts on SNs: **200**
Press release/media presence/newsletter (C): 2 different press kits will be produced (for generic and specialised media), translated in partners' languages and distributed among partners' channels. The campaign targeted to generic media will follow an easy-to-understand form of short news and long-forms shared on LinkedIn, avoiding scientific jargon; this will help the communication of the result throughout a medium that will increase the engagement through potential stakeholders. **(M1 – M36)**	TG1, TG2, TG3, TG4, TG5	- Press kit available for download in 5 languages: **1 (2 versions)** - European press releases: **at least 4** - Newsletter: **6 (every 6 months, from M6)** - News published by external pages: **50**

Table 2.3 Main NPP-SOL communication activities

As foreseen for dissemination, Consortium partners will be actively and strongly involved also in the implementation of communication activities: in particular, NPP-SOL partners will present the project, its objectives and results during scientific events.
Additionally, NPP-SOL consortium's major commitment is the development of an efficient **Sustainability and Exploitation Strategy** aiming to ensure the continuation, replicability and scale-up of main outputs of the projects. The exploitation and replications strategy will start from the guidelines provided by D5.1, aiming to exploit project results in order to transfer novel and sustainable water and nutrients management practices.
The main activities **to exploit the results** are as follows:

Trainings to SE technicians: Technicians from WUA, EA and WRM will be trained on MT use, maintenance and technical regulation of PPT developed in the project. Technicians will be the main link among NPP-SOL findings and farmers, by transferring information about background, benefits, and operational skills of the PPT and SSBMP for water and nutrients. Trainings will be held by webinars (at least 2), face-to-face meetings, on-site training-by-doing. A detailed plan of trainings will be provided at M6. At all the training event, people involved will be regularly provided with all the documentation and materials needed for trainings. Tech guidelines and handbooks will be co-edited with the NPP-SOL SE community to address soil, water, fertilizers and crop management.

NPP-SOL SHR-HUB and its local units: integrated into the headquarters of the institutions of the project partners, it aims to be the driving force for future exploitation of the project results in the countries involved in the action and beyond. In each local unit, NPP-SOL's regional partners and their SE, farmer associations, entrepreneurs, and other stakeholders will be engaged in setting up new governance and financing models and developing participatory monitoring.
The ultimate aim is to effectively implement, exploit and utilise the NPP-SOL best management practices **to prevent diffuse pollution of water resources due to NPS.**

Scientific papers: targeted to the research and academic communities, will be produced based on the results of the activities carried out within the project. These publications will show consistency with and complement the project deliverables. They will guarantee the dissemination of scientific knowledge produced by NPP-SOL to the international community. Links to the working papers will be posted on the public section of the NPP-SOL website. Given the high scientific relevance of the projects' analyses, project partners envisage publications in peer-reviewed, interdisciplinary and high-calibre journals (e.g. Water Resources Research, Journal of Hydrology, etc.), as well as in educational articles in local and regional journals will ensure the dissemination of the scientific knowledge produced by NPP-SOL to local communities.

Policy and position papers: specifically written and intended for policy makers, containing synthesis of the policy recommendations identified by the project will be published. Policy briefs are short, clear and concise documents for policymakers that highlight specifically various policy implications of specific actions emerging from the NPP-SOL and the relative bioeconomic analysis.

2.2.1 Knowledge management and protection

NPP-SOL will generate a considerable amount of knowledge, which will be managed and guided by the Project Coordinator (PC), supported by the project Scientific Advisory Board (SAB). The data collected and the outputs of the activities (particularly through the project CS) will be shared and readily available on the project website. Open-access publications in peer reviewed journals is also envisioned by the Consortium and reflected by an adequate budget allocation. Any dissemination activities and publications in the project, including the project website will (i) specify that the project has received Community research funding and (ii) display the PRIMA consortium and European emblem.
Knowledge management and **Intellectual Property Rights** (IPR) will be addressed in full compliance with the rules identified by the PRIMA Grant Agreement. To this aim, a detailed description of the Intellectual Property Rights agreement (IPR) will be part of the Consortium Agreement that will be concluded and signed by all project partners. In general terms, IPR rules will regulate: (i) the granting of access rights and (ii) the dissemination and use of knowledge according to the following basic principles:

- The background (i.e. the information and rights held prior to accession to the grant agreement) brought into the project remains the property of the partner that has generated it;
- The foreground (i.e. the results of the project activities) generated under the project is owned by the partner who has carried out the work leading to that foreground. When several partners have jointly carried out the work and their respective share of work cannot be ascertained, they shall have joint ownership of such foreground, and a "joint ownership agreement" may be drawn up for this purpose (the default regime is applied if no "joint ownership agreement" is signed).

NPP-SOL will deliver a **Data Management Plan** (DMP) that (i) specifies the identification elements and the descriptions of all the data sets collected and generated by the project, (ii) how the research data will be handled during the project and how they will be preserved and accessed after it is completed, (iii) which methodologies and standards will be used in the data creation and management, (iv) how and when the data will be shared and made open for re-use. In case parts of the research data cannot be openly shared, the DMP will provide proper motivations and data availability statements. NPP-SOL will deliver a first DMP within the first six months of the project (M6). Status of the DMP will be discussed at GA meetings and updated DMP versions will be delivered at mid-term (M18) and at the end of the project, unless otherwise agreed with the EC project officer. Moreover, new versions of the DMP will be produced whenever important changes in the data or data management policy may occur.

2.2.2 Open Science

The stewardship of NPP-SOL project will adhere to the FAIR and Open Science principles, in order to make NPP-SOL outputs efficient, reliable and responsive to scientific and societal challenges.

1- **Open research:** NPP-SOL scientific network is based on the sharing of mutual experiences, with careful planning of data production and analysis to ensure their reproducibility and replicability in the different farming systems of the target countries. A close collaboration among the centres/universities/SMEs in the partnership will be established to secure the application of the same approaches in the data collection, in the soil and water analyses and in the fields management. Protocols, procedures, and scientific data will be shared among the partners via open knowledge sources, and the scientific results will be available to the stakeholders for application in farming practices. A web-space will be created as a major and official information channel to provide concise information on NPP-SOL's activities, including partnership, work plan and outline of work packages, main publications, the link to the NPP-SOL database and so forth. Documents created in the project will be made public and given permanent URLs in the project website.
2- **Open data:** NPP-SOL will store data, results, reports, publications generated by the project in publicly available data repository, such as Open Access Infrastructure for Research in Europe (OpenAIRE), ZENODO and other institutional repositories (e.g, UNIBAS repository, UB-Dipòsit Digital).
3- **Open access:** The NPP-SOL team will follow the procedures for prompt publications in peer-reviewed, green, and gold open-access journals.

3. Implementation

3.1 Work plan — Work packages, deliverables

The structure of the NPP-SOL work plan is based on three main pillars: advance beyond the state-of-the-art; improve technology; address public engagement and social challenges. Scientific and technical management will guarantee the accomplishment of the objectives of the NPP-SOL work plan, and will ensure fluent communication among the partners, the stakeholders and the EC. The 36 months NPP-SOL project is structured in 6 Work Packages (WPs) and 23 tasks that provide 20 Deliverables (including the ethics requirements) and 13 Milestones.
The following figure provides the **flow-lines among the different WPs**:

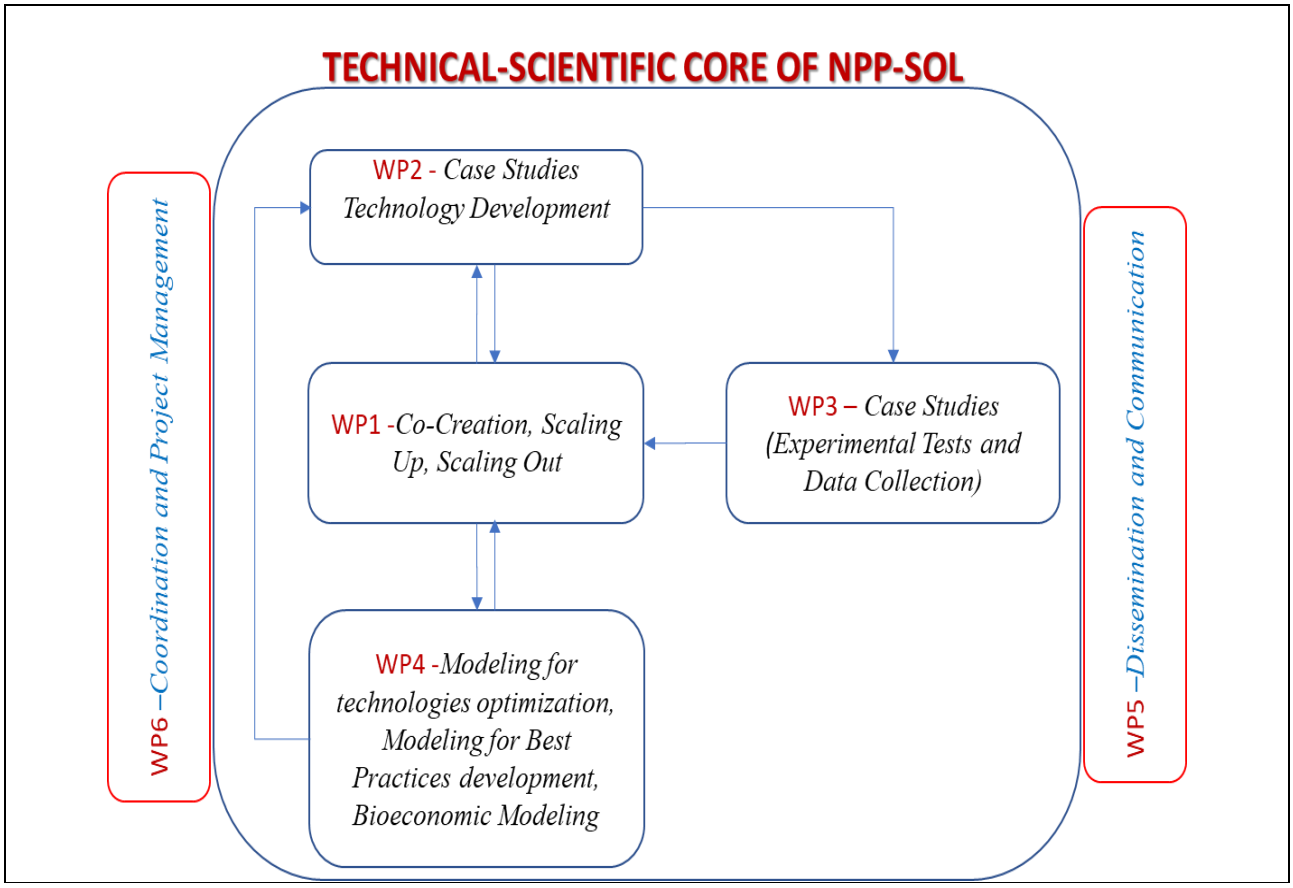

Figure 3.1. Flow-lines among the different WPs, with all the technical-scientific WPs linked to the WP1

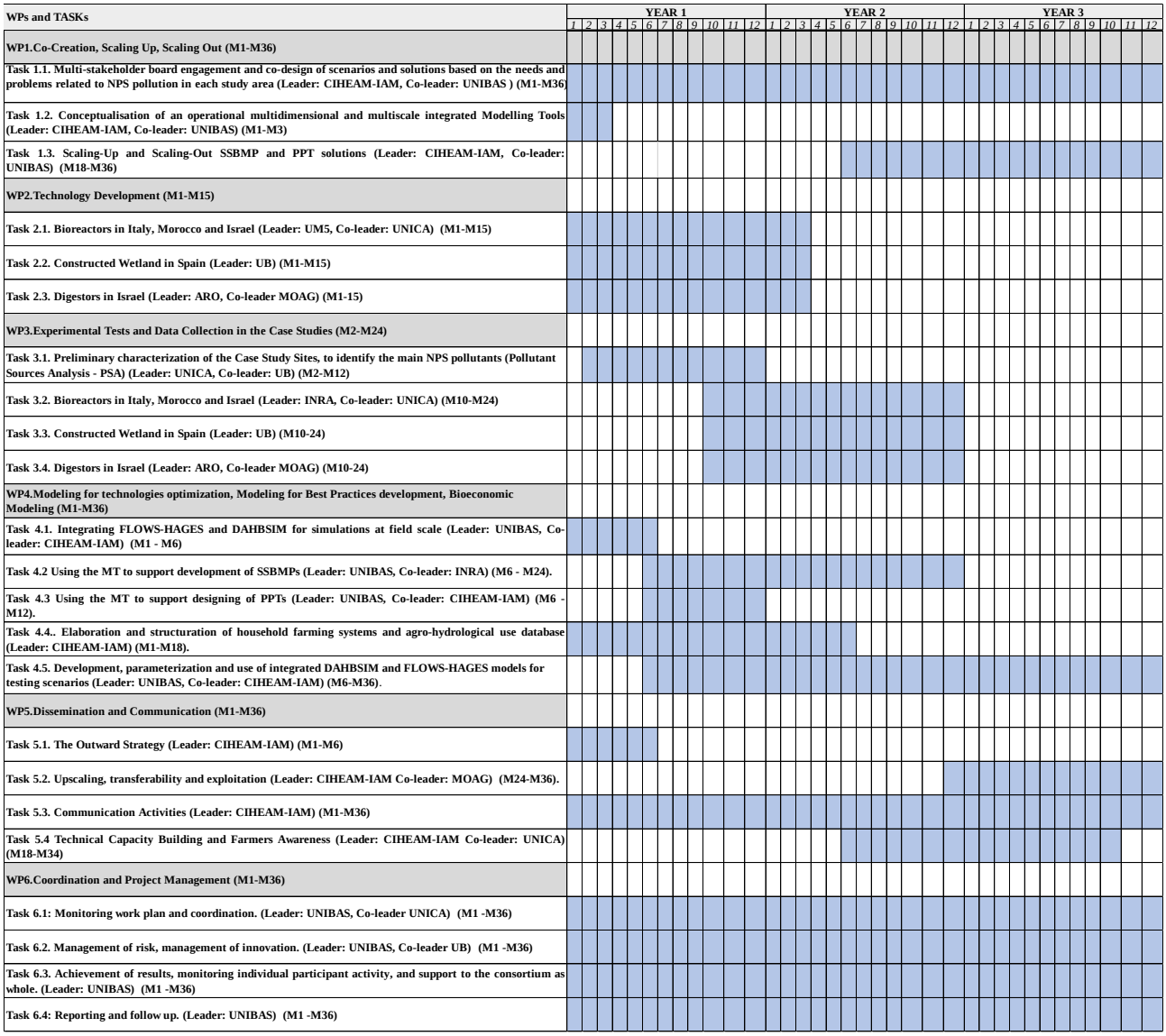

Figure 3.2 GANTT for the activities to be carried out in the different WPs

Table 3.1a: List of work packages

Work package No	Work Package Title	Lead Participant No	Lead Participant Short Name	Person-Months	Start Month	End Month
WP1	*Co-Creation, Scaling Up, Scaling Out*	4	CIHEAM-IAM	60.5	M1	M36
WP2	*Technology Development*	5	ARO	150	M1	M15
WP3	*Experimental Tests and Data Collection in the Case Studies*	3	UB	150.9	M2	M24
WP4	*Modeling for technologies optimization, Modeling for Best Practices development, Bioeconomic Modeling*	1	UNIBAS	78	M1	M36
WP5	*Dissemination and Communication*	4	CIHEAM-IAM	49.9	M3	M36
WP6	*Coordination and Project Management*	1	UNIBAS	35	M1	M36
				524.30		

Table 3.1b: Work package description (for each work package):

Work package n.	**WP1**			**Lead beneficiary**		**CIHEAM-IAM**	
Work package title	**Co-Creation, Scaling Up, Scaling Out**						
Participant number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Short name of participant	**UNIBAS**	**UNICA**	**UB**	**CIHEAM -IAM**	**ARO**	**MOAG**	**INRA**	**UM5**
Person months per participant	**6**	**4**	**4.5**	**30**	**4**	**4**	**1**	**4**
Start month	**M1**					**End month**	**M36**	

a) Settling of the project SHR-HUB and of the four *living hubs* of the four CS.
b) Defining SE-driven advices and guidelines to develop the Modelling Tool (MT) in the WP4.
c) Identifying Scaling Up and Scaling Out opportunities of the SSBMP and PTTs solutions.

Description of work

Task 1.1. Multi-stakeholder board engagement and co-design of scenarios and solutions based on the needs and problems related to NPS pollution in each study area (Leader: CIHEAM-IAM, Co-leader: UNIBAS) (M1-M36)

All the SE and at least one participant for each partner is involved in the SHR-HUB group. The SHR-HUB will integrate four ***living-hubs*** (one for each case study), including Researchers and Stakeholders**,** which will ensure continuous refinements of practices and solutions for each case study. For example, in a given case study, the scientific partner will propose a technical solution to the local SE. The latter, in turn, will interact with, say, a farmer association, which could introduce new constraints that the SE and the scientific partner will try to fulfil by adjusting the initial proposal, in an iterative, virtuous loop leading to the final solution co-designed with local SE and farmers. At least every 12 months, a face-to-face plenary meeting of the SHR-HUB, including all the living-hubs, will be held to elaborate the eventual amendments, improvements and refinements proposed by the SEs and arising from socio-economic and market changes and/or from technical farming requirements. The plenary meetings of the SHR-HUB will coincide with project meetings. At least three more virtual plenary meetings will be held during the project. These meetings will ensure crossing of information and results from any case studies to the others.

The SHR-HUB will ensure that interactions with engaged SE board are coordinated per each case study, the proposed interventions to be tested are suitable, and that knowledge generated by the project can be "actioned" by them. To meet this objective, participatory approach will be used in order to i) define the role of each engaged stakeholder, ii) explain the nature and expected socio-economic, environmental, institutional results from each intervention, iii) specify the source of conflict between the different stakeholders in adopting alternative combinations of SSBMP and PPT, and iv) through inclusive discussions, define how far the optimal identified SSBMP and PPT combinations can answer stakeholders expectations and reduce the risk of conflicts/pollution.

Task 1.2. Conceptualisation of an operational multidimensional and multiscale integrated Modelling Tools (Leader: CIHEAM-IAM, Co-leader: UNIBAS) (M1-M3)

This task will develop the conceptual framework to develop the Modelling Tool (MT) in the WP4. It will define the conceptual and methodological requirements of the integrated MT. It will provide i) theoretical basis to mobilise and combine different approaches and concepts for systems analysis, dynamic modelling, spatial and temporal up- and down-scaling, and categorization of systems diversity, ii) principles for conceptual and operational inter-linkages between integrated modelling approaches, including up- and down-scaling capabilities within the modelling chain to quantify the ecosystem services indicators at different spatial and temporal levels of the system and for different domains, iii) the main data requirements and databases structures, and iv) the key determinants to make the modelling tools flexible and generic to be implemented for all case studies taking into account their biophysical, socio-economic and institutional

diversity. Furthermore, in this task, the SHR-HUB will also design and translate external drivers and field-farm-market adaptation, including innovative cropping systems based on plant's water and nutrients use efficiency and allowing better management of irrigation water and fertilisers within the case study areas, into scenarios that can be addressed by the integrated MT, considering endogenous and exogenous variables (including climate change, market uncertainty). SHR-HUB will identify a set of ecosystem service indicators related to the different combinations of SSBMP and PPT, in an iterative loop between SE and modellers.

Task 1.3. Scaling-Up and Scaling-Out SSBMP and PPT solutions (Leader: CIHEAM-IAM, Co-leader: UNIBAS) (M18-M36)

This task aims to provide meso-economic and technical-scientific analyses of impacts and diffusion conditions of the SSBMP and PPT solutions at territory/regional levels, within the study areas of the NPP-SOL project (Scaling Up) and out of the project in areas with similar socio-economic and physical-hydrological contexts (Scaling Out). The analyses will allow the SHR-HUB to assess opportunities, risks and uncertainties perceived by stakeholders in all the SSBMP and PPT identified by NPP-SOL.

Scaling Up: The project's outputs, outcomes, and impacts coming from the technical WPs will be communicated to the SEs, supported by all partners' experience and expertise. Workshops, training with demonstration (learning-by-seeing and learning-by-doing) and meetings will be established to discuss the socio-economic, agro-ecological, and governance matters related to the SSBMP and PPT interventions. This action will illustrate certain convincing results of the interventions, share individual or collective decision-making results, and promote the communication (transfer) of scientific knowledge and dissemination of outcomes from all the project activities to increase stakeholder adoption of these interventions. In the Scaling Up, training to transfer the technical operability of SSBMP and PPT to technicians of the involved SEs (TCB) will be crucial as it is the only way to **extend** the SSBMP and PPT to the whole polluted area. On one side, TCB allows extending the results of the project beyond the lifetime of the project. On the other hand, owing to the closer contacts and exchanges between SE technicians and farmers, TCB is a necessary step toward building a FA, as skilled and qualified technicians may effectively support farmers during and beyond the project duration and illustrate and eventually persuade them of the goodness and effectiveness of the NPP-SOL solutions. **Only with farmer awareness, understanding and acceptance, the SSBMPs and PPTs developed within NPP-SOL may be spread to the whole area interested by agricultural NPS pollution**.

Scaling Out: Networking and cooperation with other research consortia, thematic living labs and groups conducting similar research in the Mediterranean region will be created (see section 1.3.3) to stimulate the exchange of knowledge and information among relevant projects, open research collaborations with the scientific community and looking for physical-agronomic contexts outside the project areas suitable for effective application of the solutions developed within NPP-SOL. In this direction, NPP-SOL will also look for engagement of external SE to the project, to be eventually integrated in the SHR-HUB, to verify the coexistence of suitable socio-economic conditions for Scaling Out of the NPP-SOL SSBMP and PPT. Institutional and market contexts will be considered, to provide a better understanding of the adoption of alternative and more sustainable management practices and technologies, also accounting for requirements of industrial, consumer, and societal demands.

Deliverables

D1.1 Settlement document of the SHR, including a detailed workplan of the SHR with activities and related procedures (M2, CIHEAM-IAM)

D1.2 Report with the description of physical and bioeconomic strategy, concepts and scenarios adopted to build operational MT integrating DAHBSIM and FLOWS-HAGES models (M15, CIHEAM-IAM

D1.3 Report on the analysis of Scaling Up and Scaling Out opportunities and related risks and uncertainties in extending NPP-SOL solutions at larger areas (M36, CIHEAM-IAM)

Work package n.	WP2				Lead beneficiary	ARO		
Work package title	Technology Development							
Participant number	1	2	3	4	5	6	7	8
Short name of participant	UNIBAS	UNICA	UB	CIHEAM -IAM	ARO	MOAG	INRA	UM5
Person months per participant	23	21	18	1	25	25	7	22
Start month	M1					End month	M15	

Objectives

a) Designing and setting up of the NPP-SOL PPT.
b) Installing sensors and data acquisition systems.
c) Testing agri-food by-products to promote denitrification.

Description of work

Task 2.1. Bioreactors in Italy, Morocco and Israel (Leader: UNIBAS, Co-leader: UM5) (M1-M15)

In the CS areas of Italy, Morocco and Israel, BR will be built on the edge of cultivated areas. A BR, serving an average area of 15 ha, will have a size of 4 m in width, 25 m in length and about 1.5 m in depth (to be verified on the basis of the depth to groundwater). The sizing has been assumed on the basis of a series of average design parameters (mostly related to the residence time of nitrates to be denitrified), which will be revisited and adjusted once the actual physical-hydrological and agronomical information of each site will be available. The walls and the bottom of the excavation must be covered with a waterproof sheet. The excavation must be equipped with windowed ducts to be laid on the bottom and in communication with the bioreactor inlet and outlet control wells. The excavation will then be filled with the high C:N ratio carbon substrate (e.g. woodchips) (for heterotrophic denitrification) up to about 30 cm from the ground level. In the cases where phosphorus and/or pesticides are also a problem, woodchips will be mixed with activated alumina/gravel mixture (for phosphate precipitation and complexation) and Biochar-amended (for pesticides removal). After covering the woodchips with geotextile, everything is covered with soil, so as to minimise hindering cultivation operations. During the filling process, three piezometers (close to the inlet, to the outlet and in the middle) are installed for periodic monitoring inside the BR. Inlet and outlet control wells will be installed to regulate the inlet flow rates, as well as the hydraulic gradient imposed between the inlet and outlet of the bioreactor. The BR receives water (and pollutants) from the artificial drainage network, as well as the runoff, which will be partly conveyed to the BR before being delivered to drainage reclamation channels. In the areas (Arborea, for example) where artificial drainage systems are not available, they have to be specifically designed and installed on the field (10-15 ha) to be served by the BR.

Task 2.2. Constructed Wetland in Spain (Leader: UB) (M1-M15)

Minor maintenance and preparatory works will be carried out at the current CW facilities, aimed at reconditioning and setting-up the site for its operation. A gravel bed will be added to the second half of the CW ("Subsurface CW"), i.e. to the area located close to the discharging point. By minimizing the equilibrium with the atmosphere, the development of anoxic conditions is expected in this area during operation, with consequent higher nutrients removal efficiency. Several short piezometers will be installed inside the gravel bed, to allow water sampling and monitoring the water quality changes during the CW operation. Emergent macrophytes (Typha and Phragmites) are expected to naturally grow in the aerobic part of the CW ("Surface CW"), acting as previous green filter and potentially providing a first smooth reduction of nutrients in water.

The existing monitoring system, consisting of fully automated sensors for the telematic measurement of water flow, nitrate concentration, turbidity, electrical conductivity and temperature in water at the inlet and outlet of the CW, will be checked, maintained, and renewed wherever needed.

Based on previous successful outcomes, laboratory batch and flow-through experiments will be carried out to test local cost-effective electron donor supplies (local wine and dairy industry by-products) to promote heterotrophic denitrification while enhancing circular economy. Once the viability of this strategy is

validated at lab scale, on-site application of the selected by-products will be performed in the CW area filled with gravels (WP3). Multi-isotopic assessment will be used for evaluating the efficiency of the denitrification strategy.

Task 2.3. Digestors in Israel (Leader: ARO, Co-leader: MOAG) (M1-15)
The main preparatory work regarding the field-scale AD will be focused on the post-treatment of the liquid digestate. These effluents are rich in NPK in addition to high level of sodium, thus, their direct application to the environment is problematic. In both lab and field scale, we will set up complementary technologies such as biofiltration, constructed wetland and hydrothermal carbonization. The outcome of this work will be monitored using bioreactors that will be installed downstream to the field-scale AD (i.e., in the buffer strip of Nahalal stream). In order to reliably monitor the quality of the treated digestate, pH and EC probes will be installed in the BR (inlet and outlet) and the data will be collected continuously.

Deliverables
D.2.1. Report on designing drainage system and BR. The Italian, Moroccan and Israeli case studies (M15, UNIBAS)
D.2.2. Report on designing CW and on conditioning works and laboratory experiments. The Spanish case study (M15, UB)
D.2.3. Report on designing AD and on the setup of AD and digestate post treatment. The Israel case study. (M15, ARO)

Work package n.	**WP3**				**Lead beneficiary**	**UB**		
Work package title	**Experimental Tests and Data Collection in the Case Studies**							
Participant number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Short name of participant	**UNIBAS**	**UNICA**	**UB**	**CIHEAM -IAM**	**ARO**	**MOAG**	**INRA**	**UM5**
Person months per participant	**21**	**21.9**	**24**	**1**	**20**	**24**	**4**	**24**
Start month	**M2**					**End month**	**M24**	

Objectives
a) Pollutant Sources Analysis and dominant practices identification in the Case studies.
b) Co-testing and validating the PPT at field scal.e

Description of work
Task 3.1. Preliminary characterization of the Case Study Sites, to identify the main NPS pollutants (Pollutant Sources Analysis - PSA) (Leader: UNICA, Co-leader: UB) (M2-M12)
This will include the collection of previous existing information/data and preliminary field characterization surveys, with on-site measurement or collection and analysis of water/solid samples (for physico-chemical parameters, major ions, trace elements, isotopic composition of nitrates and boron etc…) from selected points of Case Study sites, aimed at improving the understanding of the occurring pollution processes related to agricultural activities. Different isotopic and environmental tracers will be used also to understand the local hydrogeology and the fate of nitrate and related dynamic transformation. Analysis of nitrate concentration in soil water below the root zone will be combined with groundwater recharge rates estimated from vertical deuterium profiles in soil to calculate nitrate fluxes to groundwater. A preliminary soil characterization in the Case Studies will be also carried out.

Task 3.2. Bioreactors in Italy, Morocco and Israel (Leader: UM5, Co-leader: UNICA) (M10-M24)
During the experiments to be carried out with the BR, piezometers will allow monitoring of the main chemical-microbiological parameters inside the bioreactor by sampling and/or using multiparametric

probes. Piezometers will also be used for periodic checks of the saturated hydraulic conductivity of the filling material, which naturally tends to shrink due to the obstruction of the pores. The inlet and outlet regulation wells will play a decisive role in controlling the operating conditions of the BR, as they serve to regulate the inlet flow rates, as well as the hydraulic gradient imposed between the inlet and outlet of the BR. The gradient, together with the saturated hydraulic conductivity of the draining material, determine the water flux and, therefore, the residence times (hydraulic retention time) of the solution to be treated inside the BR. The residence times must not be too low to prevent the chain of denitrification reactions from being interrupted before the complete transformation into molecular nitrogen.
Based on the preliminary activities devoted to the identification of the main NPS pollutants and the dominant actual soil, water, fertilisers and crop farm practices, BR will be filled with a mix of materials, each adequate to remove/transform specific pollutants (woodchips for nitrates, alumina/gravel for phosphates, biochar for pesticides). Besides the piezometer-based monitoring, pollutants will also be monitored at both the inlet and outlet regulation wells. Monitoring at the inlet well will allow real-time verification of the effectiveness of the SSBMP in terms of irrigation and fertilisation techniques adopted in the farm /the field) served by the BR, based on the nutrients (and in general of agrochemicals) loads that reach the bioreactor over time, and to possibly adopt corrective measures in the SSBMP of water and nutrients. On the other side, monitoring at the outlet well will provide indications on the effectiveness of the BR in the attenuation of pollutants to be delivered to the final receiving water body. This is an effective example of how the SSBMP and the PPT will interact in NPP-SOL in the iterative look for a site-specific optimal solution.

Task 3.3. Constructed Wetland in Spain (Leader: UB) (M10-24)
Supported by the set-up and technological development from WP2, and based on the preliminary activities of Task 3.1, the field-scale application of the designed PPT will be implemented during the 2nd year of the project: operation of the CW by partial diversion of the surface water from the Lerma gully, polluted by agricultural return flows charged of nitrates, and further return of the treated water to the gully. Different operating conditions will be tested to optimize the removal efficiency. Biostimulation experiments with local food-industry by-products, first tested at laboratory scale (WP2), will be applied at field scale through injections of the selected local electron donors in the Subsurface part of the CW. Field monitoring surveys will be carried out during the CW operation and the biostimulation tests (samplings foreseen before and after the application of the electron donors), aimed at assessing - by hydrochemical and multi-isotopic tools - the efficiency of the CW as PPT for preventing nutrient release to the receiving water bodies (Arba River). The field campaigns will include the measurement of parameters throughout the on-site automated monitoring system (see description in WP2) as well as the collection of water samples from different sampling points along the wetland flow line for their further analyses.

Task 3.4. Digestors in Israel (Leader: ARO, Co-leader: MOAG) (M10-24)
Following the first year of calibration (WP2), the field scaled AD will be operated continuously including the selected post treatment. The AD system will be continuously monitored for general parameters of the AD (i.e., biogas production and %CH4 in the biogas). General parameters of the digestate (NPK as well as COD, pH and EC) will be monitored once a week before and after post treatment. In the monitoring BR (installed in the buffer strip of Nahalal River) sensors for pH and EC will provide continues observation regarding the quality of the treated digestate (inlet and outlet).

Deliverables
D3.1 Report on the validation of BR in the Italian, Moroccan and Israeli case studies, including preliminary site characterization (M30, UM5)
D3.2 Report on the validation of CW in the Lerma Case Study, Spain, including preliminary site characterization. (M30, UB)
D3.3 Report on the validation of AD in the buffer strip of Nahalal stream, Israel Case Study, including preliminary site characterization. (M30, ARO)

Work package n.	WP4			Lead beneficiary	UNIBAS		
Work package title	Modeling for technologies optimization, Modeling for Best Practices development, Bioeconomic Modeling						
Participant number	1	2	3	4	5	6	7	8
Short name of participant	UNIBAS	UNICA	UB	CIHEAM -IAM	ARO	MOAG	INRA	UM5
Person months per participant	20	5	4	20	4	9	1	4
Start month	M1				End month	M36		

Objectives

a) Integrating FLOWS-HAGES and DAHBSIM models to build the MT based on ideas and concepts coming from Task 1.2.

b) Applying MT to develop SSBMP by evaluating alternative soil, water, nutrients and crop management strategies, even under saline irrigation water.

c) Applying MT to provide the information needed to design and develop the PPT, along with the related guidelines for their optimal management.

Description of work

Task 4.1. Integrating FLOWS-HAGES and DAHBSIM for simulations at field scale (Leader: UNIBAS, Co-leader: CIHEAM-IAM) (M1 – M6)

This task refers to the set up and assembly of the MT allowing to solve water and solutes/pollutants balance in the Soil–Vegetation–Atmosphere (SVA) continuum at the field unit (FU) scale and at a daily time-step and under site-specific constraints and resource allocation patterns related to economic, production (including livestock), and consumption decisions. The resulting integrated MT will allow evaluating the impact of all types of crop and livestock management activities, as well as on-farm processing, on the production of agri-food contaminants and their optimal management to minimise the impact on the soil and water resources. MT will also include climate change applications (e.g. using the curve of plant yield response to water availability).

Examples of MT outputs, representing the base for SSBMP evaluation, are reported below:

Water:

- Soil water content in the root zone and whole soil profile;
- Evapotranspiration and Root Uptake;
- Field scale Runoff production;
- Deep percolation water fluxes and groundwater recharge.

Solutes and pollutants:

- Transport processes of solutes at the soil surface, in the root zone and in the whole soil profile, physical and chemical non-equilibrium transport;
- Nitrogen and phosphorous transport processes and transformations through mineralization, ammonification, nitrification, and denitrification, uptake;
- Pesticides transport in dissolved phase, linear and nonlinear sorption and exchange processes, first-order decay, degradation, volatilization;
- Deep percolation of nitrates, pesticides and other pollutants to the groundwater;
- Nitrogen, phosphorus and pesticides transfer from soil solution to runoff water.

Crop:

- Relation between physiological processes in plants and environmental factors such as solar irradiation, temperature and water and nutrient availability;
- Plant nitrogen budget;
- Dry matter production, yield, residue production, and decomposition;
- Water and nitrogen root uptake; compensated and uncompensated root water uptake, active and passive nutrient root uptake.

Task 4.2. Using the MT to support development of SSBMP (Leader: UNIBAS, Co-leader: INRA) (M6 - M24)

This task mostly refers to application of the FU-scale MT developed in Task 4.1 The MT will be applied to evaluate the effects of the main physical-chemical mechanisms involved in the water flow and transport of contaminants in the SVA system under site-specific environmental conditions. The procedure will take full advantage of the information provided by the activities carried out in the WP3. The database needed for MT applications consists of 1) climatic data (Rainfall, Temperatures, Radiation, etc.); 2) soil data (hydraulic properties, dispersivities); 3) groundwater data (mostly, depth to water table, contaminant concentrations in the groundwater); 4) vegetation data; 5) management data (applied irrigation volumes, applied fertilizer, mostly nitrogen, and pesticide quantities and forms).

As a final result, task 4.2 will establish management practices which under the site-specific conditions will minimise the nutrient and pesticides losses to surface and groundwater. Sensitivity runs will be carried out by making small perturbations in selected water flow and solute transport parameters, crop growth parameters, boundary conditions, including rainfall and water table levels, management parameters. This sensitivity procedure will be applied in the whole physically plausible variability range of the parameters to be perturbed, allowing identification of the parameters having the major influence on the agro-chemicals losses in a wide range of boundary conditions.

Task 4.3. Using the MT to support designing of PPT (Leader: UNIBAS, Co-leader: CIHEAM-IAM) (M6 - M12).

To be successful, the PPT developed in NPP-SOL project have to be designed on the basis of reliable estimates of the contaminant loads to be treated by each PPT. Actually, the proposed PPTs have the main target of preventing the environmental impact upon soil and water resources coming from agriculture NPS pollutants, by intercepting the pollutants before they reach the groundwater and surface water bodies. In view of this, MT developed in Task 4.1 will provide the water and pollutant quantities coming over time from a field under different management scenarios. In this sense, Task 4.3 and Task 4.2 should not be seen as disjoined. Actually, the MT are thought to be applied in sequence to develop SSBMP first and thus to designing PPTs in a concatenated procedure where PPT are designed on the basis of the SSBMP developed in the previous step. Just as an example, designing BR will require first to identify the SSBMP minimising the contaminant loads to the surface and groundwater. These SSBMP and related "optimised" loads will be used as input to design the BR in terms of sizing, travel time necessary to denitrification, hydraulic gradients and flows to be imposed in the BR.

Task 4.4. Elaboration and structuration of household farming systems and agro-hydrological use database (Leader: CIHEAM-IAM) (M1-M18).

A specific farm survey will be realized in irrigation perimeters within each of the case study areas to characterize irrigated farming systems diversity. The target of this survey is to identify for each household farm (i) the current cultivated crops, rotations, crop management practices (including irrigation water management) and yield; (ii) the most representative arable farming systems based on structural and functional criteria. The selected household farms will be linked with their relevant water flow and solute transport, allowing us to simulate ecosystem services indicators (with a focus on water associated ecosystems) for a better trade-off analysis and feedback with local stakeholders and an upscaling analysis.

Task 4.5. Development, parameterization and use of integrated DAHBSIM and FLOWS-HAGES models for testing scenarios (Leader: UNIBAS, Co-leader: CIHEAM-IAM) (M6-M36).

This task will develop parametrize and implement, as conceptualized in task 1.2, the integrated DAHBSIM and FLOWS-HAGES models. This task will be achieved into two steps: i) improving the Dynamic Agricultural Household Bio-economic SImulation (DAHBSIM) model by integrating FLOWS-HAGES models for a better assessment of a soil water and solute transport, and ii) adapting and parametrizing the modified DAHBSIM model for the assessment of the socio-economic and environmental impacts of the co-designed SSBMP and PTT based-scenarios (task 1.2) on the sustainability of the various farm types of CS. The assessment of each scenario will be considered by taking into account climate, market shocks and change, and groundwater quality and level fluctuation as well.

Deliverables

D.4.1. FLOWS-HAGES software and related handbook (M3,UNIBAS) **D.4.2.** DAHBSIM software and related handbook (M3,CIHEAM) **D.4.3.** Integrated NPP-SOL MT and related handbook (M6,UNIBAS) **D.4.3.** SSBMP obtained for each CS and related guidelines (M30, UNIBAS)

Work package n.	**WP5**				**Lead beneficiary**	**CIHEAM-IAM**		
Work package title	**Dissemination and Communication**							
Participant number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Short name of participant	**UNIBAS**	**UNICA**	**UB**	**CIHEAM -IAM**	**ARO**	**MOAG**	**INRA**	**UM5**
Person months per participant	**5.5**	**3.5**	**3**	**29**	**2**	**2**	**1**	**3**
Start month	**M1**					**End month**	**M36**	

Objectives

a) Communicate and disseminate project's activities and results, with the final objective of amplifying and raising awareness about NPP-SOL added value in economic, technical, environmental and social terms.
b) Disseminate the results to stakeholders beyond those directly engaged in the project.

Description of work

Description of work

Task 5.1. The Outward Strategy (Leader: CIHEAM-IAM) (M1-M6)

A clear and comprehensive Plan will be created and used as a roadmap to maximise the impact of these activities within NPP-SOL, where detailed description of the relevant communication, dissemination, capacity building, scaling out and exploitation strategy will be provided. The Plan will identify the specific target groups' needs and will shape the tools accordingly, by considering the needs of policymakers and stakeholders at local, Mediterranean, and EU level, the international scientific community, the industry, business associations and farmers, the media, and the general public.

After a first version, to be drafted at the beginning of the project activities, (D5.1), it will undergo periodic review. The Outward Strategy will include goals of the activities, target groups, key messages, channels, timetables, and responsibilities, as well as standards and procedures for preparing, writing, and organising project deliverables, reports, and results for dissemination. A draft version of the Plan is described in Section 2.2.

Task 5.2. Upscaling, transferability and exploitation (Leader: MOAG Co-leader: CIHEAM-IAM) (M24-M36).

This task is strictly connected to the Task 1.3 in the WP1 and related to identifying Scaling Out opportunities. It will be dedicated to the transferring and exploitation of main project results. In particular, in this task project partners will analyse the challenges and opportunities in terms of transferability of results from the project-specific case studies to other cases (and particularly to other basins in the Mediterranean area). Special attention will be paid to vulnerable social groups (farmers from arid zones, small-scale farmers, climate-vulnerable communities) which are in urgent need of innovative solutions for improving soil, water, fertilizers and crop management and s for preventing natural bodies pollution but lack innovation capacity. An ad-hoc report will be the key deliverable of the task.

Task 5.3. Communication Activities (Leader: CIHEAM-IAM) (M1-M36)

Targeted communication activities will be implemented by the project including: i) The visual identity of NPP-SOL project including an official website, a logo, banners, templates for project-wide use in all types of communication such as newsletters, factsheets, posters, flyers, roll-up, press-releases, presentations, practice abstracts etc.; ii) Elaboration, implementation and constant update of a project website i.e. a

platform where clear, concise and up-to-date information will be offered; iii) Virtual communication activities. Projects results and communication products will be spread by using the social channels of the Consortium partners, including social media, blogs, and twitter accounts, so that a vast community of end-user will be reached; iv) Elaboration of basic communication tools including a leaflet and targeted factsheets and infographics; v) Media relations. Project partners will directly engage media representatives through the production of press releases and press conferences; vi) Specific actions will be undertaken by all partners to tailor and adapt the project dissemination materials to the needs of target groups at local level (including translation in local language).
Newsletters (e.g., biyearly electronic newsletters) will also be issued with news, events, and progress updates. Videos will provide an overview of the activities in the study areas will be prepared.
In the third year of the project, the participation of NPP-SOL partners in international thematic conferences will be supported to maximize the NPP-SOL outcome visibility.

Task 5.4 Technical Capacity Building and Farmers Awareness (Leader: CIHEAM-IAM Co-leader: UNICA) (M18-M34)
The overall goal of TCB and FA activities is to guarantee the operability of the modelling and technological tools in the long run by building a self-sustaining capacity inside WUA, EA and WRM. Technical Capacity Building (TCB) will be dedicated to advancing and enhancing the capabilities of SEs to adapt and manage the PPTs and SSBMPs developed in the project. In the FA activities, the SE Technicians will be the main conduit to transfer benefits coming from the application of NPP-SOL solutions to farmers.
Modelling (TCB activities): Technicians from WUA, EA and WRM will be trained to run the modelling tool independently, with the aim of real-time adjustments and optimizations of the NPS pollution-preventing technologies developed in the project with changing scenarios in terms of climate, crop, and irrigation management. Trainings on Modelling will be held simultaneously for SEs of all the Case Studies, through webinars and face-to-face during the project conferences. Specifically, the training plan and related documentation (handbooks and other materials) will be available at M6. Five training courses will be held at M12 (webinar), M18 (mid-term conference), M24 (webinar) and M30 (webinar);
Maintenance and technical regulation (TCB activities): The NPP-SOL Pollution-Preventing technologies need to be maintained and regulated beyond the project lifetime. Training with demonstration will assure the sustainability of the action. After the setting up of the PPTs and preparing the related guidelines (M15), CIHEAM-IAM will provide a detailed plan of the on-site trainings (scheduling, people involved, topics), for each Case Study, devoted to the operation of the technologies (training by doing). The guidelines prepared within the WP2 will be the main documentation to be used for trainings.
Involvement and assistance to farmers (FA activities)*:* Best practices will be analysed, transferred and shared, adopting farmer-friendly and context-related approaches. Information and training will be provided on meaning, background, benefits, and operational skills of the technologies and site-specific, modelling-based, water and nutrients good management practices to farmers to induce a deeper awareness of the environmental issue related to their farming behaviour. 3 half-day demonstration events will be organized for each CS. During the trainings by doing (see the item above), the local SEs will establish modes and procedure to involve farmers (M15).

Deliverables
D.5.1 The NPP-SOL Outward Strategy (M3, CIHEAM-IAM)
D.5.2 First dissemination and know-how transfer report (M14, M26, M36 CIHEAM-IAM)
D.5.3 NPP-SOL Training Report (M26, CIHEAM-IAM)
D.5.4 Transferability and exploitation Report (M36, MOAG).

Work package n.	**WP6**				**Lead beneficiary**	**UNIBAS**		
Work package title	**Coordination and Project Management**							
Participant number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**

Short name of participant	UNIBAS	UNICA	UB	CIHEAM -IAM	ARO	MOAG	INRA	UM5
Person months per participant	20	3	2	2	2	2	1	2
Start month	M1					End month	M36	

Objectives

a) Project's progress monitoring and project's objectives achievement on time according to the budget.
b) Ensuring the quality and punctuality of scientific outputs.
c) Maintaining communication with EC, ensure the internal communication within the Consortium.
d) Managing administrative and financial issues.
e) Ensuring compliance with all relevant regulations, including knowledge management issues, gender and ethical issues.

Task 6.1: Monitoring work plan and coordination. (Leader: UNIBAS, Co-leader UNICA) (M1 -M36)

During the kick-off meeting, the meeting agenda will be set for the whole project, and the composition of the **Steering Committee (SC)** and the **Scientific Advisory Board (SAB)** will be defined. The **Project Management Board (PMB)** will be made by UNIBAS staff specifically dedicated to this task. A **Communication Manager** will implement the communication plan (WP5) and using social media. The SC will be made by one representative of each partner of the Consortium. The first step will be the refinement of the NPP-SOL working plan and the risk management plan. The plan of research and dissemination activity will be discussed during the kick-off meeting, to update it and potentially extend it. Periodical updates of risk identification, risk assessment and implementation of risk response strategies will be done by PMB and discussed with the SC. A **Data Management Plan (DMP)** will be defined at M6, progress activities will be carefully monitored with specific attention to risk management and related mitigation measures. Risk related to the implementation of the project will be monitored by PMB and SC. If necessary, recovery actions will be identified, and the activities will be revised accordingly.

Task 6.2. Management of risk, management of innovation. (Leader: UNIBAS, Co-leader UB) (M1 -M36)

Besides critical risk**,** potential risk relevant to NPP-SOL can be divided into different categories. **Scope Risks** are tasks that endanger project objectives, deliverables, or timeline. To avoid the odds of this happening, NPP-SOL activity plan comprises consistent concrete goals and task dates for each phase and beneficiary teams. **Cost and Resource risks** were already minimised by careful analysis of costs according to the different countries budgets and the committed duties. **Time Risks** are related not only to delay in delivering reports, materials and products, but also to delay in experiments due to climate adverse conditions. **Technology and Communication Risks**, all the members of the consortium are aware of the potential of communication and the risk of communication tools will be taken into account in digital and voice communication. **Miscellaneous Risks** natural disasters affecting field trials can be afforded by changing the field site. Within the multi-actor approach of NPP-SOL, innovation and IPR will be managed in tight collaboration with the WPs leaders. The focus will be on constructing follow-up and then transferring technologies to the SE and potential entrepreneurs.

Task 6.3. Achievement of results, monitoring individual participant activity, and support to the consortium as whole. (Leader: UNIBAS) (M1 -M36)

Beneficiaries were selected and assembled to achieve a complementary and inter-exchangeable expertise. Each main field of expertise is not represented by only one unit but at least three different units can cover, respectively, soil science, mineral and chemistry science, geology and hydrogeology, environmental modelling science, law and economy science, dissemination and communications science. In this way, the duties and the tasks are supported by a robust enough team. This also allows for resolving risk related by non-effective or not sufficient support to implanting activities by one of the beneficiaries.

Task 6.4: Reporting and follow up. (Leader: UNIBAS) (M1 -M36)

Documentation, reporting and evaluation will be periodically done to carry out risk management and dissemination activities. In this task, proper communication with the EU will be implemented. Internal reporting will be done every six months based on reporting of each WPs. As already mentioned, an annual general meeting will be held and results of each WPs will be presented. During the last NPP-SOL meeting, final reporting and post project activities will be envisaged, these comprise closure of contracts, exploitation of results, potential project follow-up and continued dissemination.

Deliverables
D6.1 Kick off and I Steering Committee meeting minute. (M2, UNIBAS)
D6.2 Data Management Plan. (M6, Update 18, 30, UNIBAS)
D6.3 NPP-SOL Guidelines on the value of the scientific, technical and societal results of the project related to NPP-SOL research and innovation activities. (M33, UNIBAS)

Table 3.1c: List of Deliverables

Deliverable	Deliverable name	WP n.	Short name of lead participant	Type	Dissemination level	Delivery date (in months)
D.1.1.	Settlement document of the SHR, including a detailed workplan of the SHR with activities and related procedures;	1	CIHEAM-IAM	R	PU	M2
D.1.2	Report with the description of physical and bioeconomic strategy, concepts and scenarios adopted to build operational MT integrating DAHBSIM and FLOWS-HAGES models	1	CIHEAM-IAM	R	PU	M15
D.1.3.	Report on the analysis of Scaling Up and Scaling Out opportunities and related risks and uncertainties in extending NPP-SOL solutions at larger areas	1	CIHEAM-IAM	R	PU	M36
D.2.1.	Report on designing drainage system and BR. The Italian, Moroccan and Israeli case studies	2	UNIBAS	R	PU	M15
D.2.2.	Report on designing CW and on conditioning works and laboratory experiments. The Spanish case study	2	UB	R	PU	M15
D.2.3.	Report on designing AD and on the setup of AD and digestate post treatment. The Israel case study	2	ARO	R	PU	M15
D.3.1.	Report on the validation of BR in the Italian, Moroccan and Israeli Case Studies	3	UM5	R	PU	M30
D.3.2.	Report on the validation of CW in the Lerma Case Study, Spain	3	UB	R	PU	M30

D.3.3.	Report on the validation of AD in the buffer strip of Nahalal stream, Israel Case Study	3	ARO	R	PU	M30
D.4.1.	FLOWS-HAGES software and related handbook	4	UNIBAS	SW &R	PU	M3
D.4.2.	DAHBSIM software and related handbook	4	CIHEAM-IAM	SW &R	PU	M3
D.4.3.	Integrated NPP-SOL MT software and related handbook	4	UNIBAS	SW &R	PU	M6
D.4.4.	SSBMP obtained for each case study and related guidelines	4	UNIBAS	R	PU	M30
D.5.1.	The NPP-SOL Outward Strategy	5	CIHEAM-IAM	R	PU	M3
D.5.2.	First dissemination and know-how transfer report	5	CIHEAM-IAM	R	PU	M14, M26, M36
D.5.3.	NPP-SOL Training Report	5	CIHEAM-IAM	R	PU	M26
D.5.4.	Transferability and exploitation Report	5	MOAG	R	PU	M36
D.6.1.	D6.1 Kick off and I Steering Committee meeting minute	6	UNIBAS	R	PU	M2
D.6.2.	Data Management Plan	6	UNIBAS	R	PU	M6 UPDATE M18-M30
D.6.3.	NPP-SOL Report on the value of the scientific, technical and societal results of the project related to NPP-SOL research and innovation activities	6	UNIBAS	R	PU	M33

3.2 Management structure, milestones and procedures

The management of the NPP-SOL project is based on shared responsibility, joint ownership and good communication. Where possible, decisions will be taken on the basis of consensus. A clear management structure is needed to ensure that the project work is executed smoothly. This includes clear lines of responsibility and communication between project partners, clear reporting and inclusive decisions. Successful delivery will draw robustly on independent advice from international experts and pro-active engagement with stakeholders. A **Consortium Agreement** defining the internal rules and governing the Consortium activities, the roles and duties of the Consortium, the decision making process and the process for the resolution of conflicts between partners, will be signed by all partners at the start of the project.

The **Management Structure** of NPP-SOL will be constituted by the **Project Coordinator (PC)** and the **Project Management Board (PMB)**, the **Steering Committee (SC)**, and the **Scientific Advisory Board (SAB).** Furthermore, a **General Assembly** will provide executive leadership necessary to run the project successfully from a scientific point of view and in line with the outputs from the NPP-SOL SE. The **PC** will be UNIBAS and a **PMB** will be instituted at the beginning of the project made up of the **PC** and the **management support staff.** The **PMB** will be responsible of: (i) issuing the Consortium Agreement and ensuring its compliance; (ii) ensuring the administrative and; (iii) circulating all appropriate information among project partners; (iv) monitoring and harmonizing partners' activities; (v) supporting the partners in coordinating and carrying out their assigned Work Packages (WPs) and Tasks; (vi) guaranteeing that the implementation of WPs and Tasks is coherent to the established Milestones, Deliverables and deadlines; (vii) collecting periodical financial and technical reports produced by partners; (viii) collecting the half-year internal reports by the Work Package Leaders; (ix) acting as intermediary between the Consortium and the European Commission; (x) producing periodical reports on project's activities to the Funding Authority; (xi) promoting communication among the consortium. A **Communication Manager (CE),** part of the CIHEAM-IAM, will be responsible, in collaboration with the PMB, of organizing the Project and the SC annual meetings, the Kick-off, and the final meeting as well as the coordination and monitoring of the Dissemination, Communication activities and Exploitation of results.

Work packages and **Tasks** have one or two leaders each, who take on the responsibilities for the research and activities implementation, organize the partners participation, monitor progresses, ensure the fulfilment of the specific objectives listed as deliverable and milestones, communicate approaches and achievements, and initiate the risk control mechanism if required. Namely, the **WP leader** is responsible for managing the respective WP as a self-contained entity with appropriate attention to the overall work plan and objectives of the project, and for reporting updates on the WP implementation (short half-year internal reports) and other communications to the PC. The WP leaders are supported by the **task leaders**, which are in charge of the development and successful completion of the respective Tasks within each WP, and of reporting progresses (at least quarterly, by electronic means) and other communications to the WPs leader.
The **Steering Committee**, set-up at the beginning of the project and made up of at least one reference person from each Partner, is collectively the **decision-making, monitoring and strategic management body**. It supports the PC in guaranteeing the correct implementation of the activities and the achievement of the objectives of the project within the established deadlines. The **SC** decision making will be based on consensus; if this is not reachable, a majority vote will be required to approve decisions.
Regulations on the agenda, distribution and acceptance of minutes and type of decisions requiring a certain/specific majority will be laid down in the Consortium Agreement. The **Scientific Advisory Board** will be composed by members not directly involved in the project with a very good depth and breadth of expertise. The main function of this body is the evaluation of project progress, and providing guidance regarding future work. They will recommend on what the user needs are, possible dissemination routes, advise on formats for research outputs, help brainstorm challenges that are identified during the project and spot science opportunities for the project team. Participation will include informal telephone and email communication with work package leaders, attendance to occasional meetings and participation in the main meeting of NPP-SOL with comments or suggestion on reports and papers developed by the project members. The SAB will consist of at least 4 members representing the i) international scientific community, ii) European industrial community and, iii) Mediterranean social-economic community.
The **SHR-HUB** at the CIHEAM-IAM and the four **living-hubs**, one for each case study, will ensure horizontal management of activities and ongoing redesign of activities where necessary. The structure is designed so that the expected impacts converge fully with the effective utilisation of the results. Four local physical workshops will be organized by each living-hub to discuss the development of the different CS activities. Information, data and remote workshops will also be organized and will involve the SE of all the case studies for exchange of experiences. Dissemination events and field visits will be organised to present and discuss preliminary results of the project. Meetings, workshops and field visits will be organised as simultaneously as possible to optimise time and resources.
The **NPP-SOL website** will also contain a secure area (intranet) to facilitate internal communication and document sharing among Consortium partners.

3.2.1 Quality assurance and Risk Assessment

A set of parameters and key performance indicators will be described by the PC with the support of the PMB, to carry out quality control and risk assessment. The risk assessment will imply the monitoring of the technical risks and the subsequent implementation, if needed, of risk mitigation policies or contingency plans, previously approved by the SC. UNIBAS is responsible for the quality and timeliness of deliverables and reports submitted/released to the Funding Authorities. Internal evaluation process will be applied for each document created by the Consortium to ensure its quality prior to its submission. Additionally, the SAB and the SE will also contribute to the quality of project results by validating the overall direction of the project, providing inputs and outputs on specific activities and feedback on results and their potential exploitation. The PMB will support all partner to report to the respective Funding Authority any problems concerning severe delays, financial matters, and contract matters.

3.2.2 Milestones for progress review

A list of milestones has been outlined, which serves as a tool to ensure the project quality. The monitoring of these milestones allows to identify potential deviations and apply corrective actions to achieve the expected results.

Table 3.2a: List of milestones

Milestone number	Milestone name	Related WP(s)	Due date (in month)	Means of verification
MS-1	Kick-off meeting	WP6	M1	Kick-off meeting report
MS-2	SHR-HUB set up	WP1	M3	Assessment of SHR-HUB and the four local units
MS-3	Experimental sites identification	WP2	M4	Agreements with SE and end-users
MS-4	Launch of the training on modelling tools (MT)	WP4	M6	Documentation and training material; handbooks for partners and SE technicians
MS-5	NPP-SOL web-site	WP5	M6	NPP-SOL Web Site Online
MS-6	Scientific/Technical Training Plan defined and validated	WP5	M6	Training programs defined and validated
MS-7	Training material	WP1,WP 2, WP3,WP 4, WP5	M12	Documentation and training material ready; Training material have been distributed to partners
MS-8	PPT set up and sensors installation	WP2	M12	Data graphs on the NPP web-site
MS-9	Mid term conference	WP6	M18	Report on the meeting results
MS-10	Four local workshops for SE	WP5	M24	Workshop held (workshop proceedings, dissemination material)
MS-11	Evaluation of the PPTs and SSBMPs (including Scaling Up and Scaling Out potentialities)	WP1	M30	Evaluation report including: i) comments from SEs involved in the SHR-HUB and in other projects related to NPP-SOL issues; ii) Scaling Up and Scaling Out potentialities
MS-12	Final conference	WP6	M36	Report on the meeting results
MS-13	Scientific workshop (to be held during the final conference)	ALL WPs	M36	Workshop held (workshop proceedings, participant feedbacks)

3.2.3 Project monitoring and risk assessment

Project progress will be continually monitored by WP leaders, PC, and the PMB when a discrepancy between the foreseen task and the progress is observed corrective measures will be taken. An initial risk assessment has been identified (Table 3.2b) and will serve as a good basis to build on.

Table 3.2b: Critical risks for implementation

Description of risk (indicate level of likelihood: Low/Medium/High)	Wp(s) involved	Proposed risk-mitigation measures
Partner Withdrawal (L)	All WPs	All efforts will be made to solve the critical problems that could lead to this choice. If that is not enough, solutions will be taken (e.g. new partners) in agreement with the funder's rules.
Defaulting partner (L)	All WPs	The PC and the SC will assess the progress of the project and eventual underperformance of each partner. In the case of persisting underperformance, the partners will declare it defaulting partner and terminate its participation on the project.
Poor management and coordination (L)	WP6	Risk minimized by the extensive experience of the PC and SC in coordinating and managing EU and national projects. In case of unforeseen events (or COVID-19 pandemic effects), coordination and management tasks will be driven by other experienced persons belonging to the partnership institutions.
Staff departure to a different institution/position (M)	All WPs	The effort will be spread over the remaining components. New recruitment option to be evaluated
Delays in delivery – there could be several technical or managerial reasons why deliverables will not be produced at the planned time (M)	All WPs	All partners are highly motivated to reach the project objectives, defined in the common interest of all. A careful distribution of duties within the different participants will be done to avoid work overload issues. In the case of major delays and difficulties, the work plan will be reviewed and resources reallocated to reabsorb delays on critical points and maintain the overall project schedule. The PC and the PMB will continuously monitor the fulfilment of the delivery deadlines.
One or more of the partners do not receive funding from respective Ministry or there exist a delay on it (M)	All WPs	The other partners can continue its work, while the partner with funding problems will be supported (i) to solve the administrative and financial issues and (ii) to participate with alternative funding
Lack of available data for the assessment of the PPT and SSBMP (L)	WP2 to WP4	The project involves a wide range of stakeholders strongly supporting data provision. Moreover, the databases will be extended through data collected by individual partners in their CS.
Problems in on-farm demonstration of the SSBMP and PPTs (L)	WP2, WP3	Analyse the problems case by case evaluating different possible scenarios to find solutions with SE.
Poor acceptance of the SSBMP and PPTs by the target audiences (L)	WP1, WP5	The SE will be involved in the project from the beginning. Rather, they have been and are the driving force for this proposal. Training and workshops will be organized for a continuous interaction with SE and readjustments will always be possible to prioritise the impact of the project, i.e. the use of its results.
Poor social engagement and transfer of scientific findings to stakeholders and general society (M)	WP1, WP5	Risk minimized by i) all partners are actively engaged with a wide range of stakeholders that will be mobilized during the project; ii) the active participation of SE in the SHR-HUB; iii) a dense dissemination and communication activity; iv) a specifically designed training plan.
Risk of not accomplishing significant scientific and societal impact across all the involved countries. (L)	All WPs	Risk be mitigated by organizing high-quality interdisciplinary meetings, training events, and education opportunities, involving a combination of experienced and well-known researchers from different disciplines, as well as relevant stakeholders, who will ensure the delivery of excellent scientific results and effective management outputs.
The dissemination strategy does not produce results in	WP 5	The impact of the dissemination strategy will be monitored throughout the project lifecycle and adjustment will be applied

terms of awareness and enrolment of users, (L)		until the cost/impact ratio of the dissemination strategy is deemed correct.
Lower number of visits to the website than expected (L)	WP5	Wide dissemination of the URL will be planned and updated to avoid this risk. All partners will use different channels to draw visitors to the website: social media, newsletter, digital outlets, etc. In addition, the website will be promoted at all the events partners in the consortium attend, as well as in any face-to-face communications, while the URL will be included in the brochures, posters and other promotional material.
Low number of participants attend to workshops organized along the project (L)	WP1, WP5	Partners supporting open workshops will early be communicated to the target audience, including government authorities, representatives from the environmental sectors and related industries and services and other projects focusing on the project's topics and will make the agenda relevant for the target audience.

3.3 Consortium as a whole

A high-quality consortium is made of outstanding individual partners and a simple and smart management structure. The NPP-SOL consortium has been drawn together to maximize research advances and minimize risks by following three key principles:

1. A successful recorded performance of teamwork, cohesion and research achievement.
2. Deep and broad multidisciplinary-complementary expertise.
3. Strong leadership and organization.

NPP-SOL consortium results from previous and long-time collaborations and meets the requirements of the Call. The proposed consortium involves partners so as to ensure highest professional standards in terms of quality insurance and traceability. The participants to the consortium have been selected for their competence, proven in several international projects, their knowledge, presence and potential influence at the local scale, their capacity to complement each other as well as to address the whole range of issues raised in the call. Indeed, the broad scope of the project requires many types of competences.

The interdisciplinarity nature of the Consortium and the main role of each partner has been described throughout the project, mainly in sections 1.3.2 and 1.3.4.

NPP-SOL includes 8 partners, 4 from European countries (2 Italy, 1 Spain, 1 France), 2 from Israel and 2 from Morocco. All partners together provide the necessary range of expertise, competence and operational capacity to deliver the innovative project objectives. This type of project necessitates a solid multidisciplinary expertise. For this reason, the consortium was designed to ensure the participation of a group of WUA, EA and WRM institutions (called here Stakeholder Entities – SE, Table 1.2) whose mandate is to manage water resources and protect their environmental quality in the partner countries, which have co-designed this proposal and confirmed their willingness to participate in the NPP-SOL partnership. Mainly within the WP1, the SE will orient the development of PPT and SSBMP and produce feedbacks about prospective applications of the tools developed in NPP-SOL. The SE will be involved throughout the project's lifetime, working with core partners in the implementation of scientific activities.

The consortium of NPP-SOL includes public universities, research and international institutions, national public authorities from different fields of expertise. Detailed description of each partner is provided in the Section 4.

3.4 Resources to be committed

The allocation of person-month effort of all the partners is summarized in the table below. They have been calculated based on the responsibilities of partners, the complexity of activities and the resources needed. The total effort of the project is **524.3 person-month over the 36 months** of project duration.

Table 3.4a: Summary of staff effort

	WP1	WP2	WP3	WP4	WP5	WP6	Total Person-Months per Participant
1/UNIBAS	6.0	23.0	21.0	20.0	5.9	20.0	**95.9**
2/UNICA	4.0	21.0	21.9	5.0	3.0	3.0	**57.9**
3/UB	4.5	18.0	24.0	4.0	3.0	2.0	**55.5**
4/CIHEAM-IAM	30.0	1.0	1.0	20.0	29.0	2.0	**83.0**
5/ARO	4.0	25.0	20.0	4.0	2.0	2.0	**57.0**
6/ MOAG	4.0	25.0	24.0	9.0	2.0	2.0	**66.0**
7/INRA	4.0	15.0	15.0	12.0	2.0	2.0	**50.0**
8/UM5	4.0	22.0	24.0	4.0	3.0	2.0	**59.0**
Total Person Months	**60.5**	**150.0**	**150.9**	**78.0**	**49.9**	**35.0**	**524.3**

Table 3.4b: 'Other direct cost' items (travel, equipment, other goods and services, large research infrastructure)

1. UNIBAS	**Cost €**	**Justification**
Travel	25.000,00	Travel and subsistence costs for: field data collection and sampling in Case Study areas; Project meetings, SHR-HUB opening, Conferences and other dissemination activities, SAB and SE travels costs, etc.
Equipment		
Other goods and services	89.705,35	Consumables for lab&field sampling and analysis (e.g. sampling cylinders, materials for soil hydrological properties, reactives, etc.); Registration to Congresses; Logistic for Project Meeting organization; Open Access fees for publications; Couriers services; Subcontracting for software development, etc.
Total	**114.705,35**	

2. UNICA	**Cost €**	**Justification**
Travel	20.000,00	Travel and subsistence costs for: field data collection and sampling (i.e. hydrochemical and multi-isotopic, soil sampling, agricultural practices, etc.) in Case Study areas; Project meetings, Conferences and other dissemination activities, SAB and SE travels costs, etc.
Equipment	15.000,00	Small lab&field equipments (e.g. data loggers for experiments&field monitoring; tablet for sampling activities and continuous data collection; etc, tensiometer, TDR, etc).
Other goods and services	12.000,00	Consumables for lab&field sampling and analysis (e.g. filters, bottles, flasks, acids, reactives, internationl standards, gas bottles, etc.); Registration to Congresses; Open Access fees for publications; Couriers services; Additional analyses not feasible at UNICA.
Total	**47.000,00**	

3. UB	**Cost €**	**Justification**
Travel	17.052,50	Travel and subsistence costs for: field data collection and sampling (i.e. hydrochemical and multi-isotopic, agricultural practices, etc.) in Case Study areas; Project meetings, Conferences and other dissemination activities, SAB and SE travels costs, etc.
Equipment	6.650,00	Small lab&field equipments (e.g. Mixer, pumps and data loggers for experiments&field monitoring; laptop for continuous data collection; etc.).

Other goods and services	55.700,00	Consumables for lab&field sampling and analysis (e.g. filters, bottles, flasks, acids, reactives, internationl standards, gas bottles, etc.); Registration to Congresses; Logistic for 1 Project Meeting organization; Open Access fees for publications; Couriers services; Subcontracting for Wetland maintainance, works and filling (gravel) material; etc.
Total	**79.402,50**	

4. CIHEAM-IAM	**Cost €**	**Justification**
Travel	43.000,00	Travel costs for: field data collection (i.e. socio-economic: farm size, labour allocation, risk, marketshare; land use, crop selection, agriultural practices etc.) in the case study areas; scaling out, dissemination and exploitation activities.
Equipment	7.000,00	Lisence for modeling softwares.
Other goods and services	26.500,00	For organisation of focus groups within the stakeholders of the case studies for co-designing the scenarios to be simulated, SHR-HUB opening.
Total	**76.500,00**	

6. MOAG	**Cost €**	**Justification**
Travel	1.000,00	Transport for workshop meetings and accommodation. (MOAG Principal Investigator has an external funding for traveling).
Equipment	1.000,00	Consumables for sampling
Other goods and services	276.450,00	This is an external independent budget of the Nahalal stream restoration project. It includes: 1. ecological restoration of the buffer strip such as planting trees; 2. installation of a hydrometric station; 3. installation of continues water quality monitoring system; 4. installing 1 bioreactor facility @ the buffer strip and monituring sensors.
Total		

7. INRA	**Cost €**	**Justification**
Travel	20.000,00	Transport and accommodation (kick off and project end meeting) + Transport and accommodation for workshop, field data collection, SAB and SE travels costs.
Equipment	45.000,00	Small lab&field equipment; Equipment for sampling and analysis; data-loggers and pc for field monitoring and continuous data recording
Other goods and services	25.000,00	Consumables for lab&field; Registration to Congresses; Logistic for Project Meeting organization; Open Access fees for publications.
Total	**90.000,00**	

8. UM5	**Cost €**	**Justification**
Travel	20.000,00	Transport and accommodation for 3 people (kick off and project end meeting) + Transport and accommodation for workshop (3 personne), field data collection, SAB and SE travels costs.
Equipment	51.600,00	Lab&field analysis and sampling equipments; laptops; data-loggers.
Other goods and services	18.400,00	Consumables for lab&field; Registration to Congresses; Logistic for Project Meeting organization; Open Access fees for publications.
Total	**90.000,00**	

Section 4: Members of the consortium

4.1. Participants (applicants)

Partner: UNIBAS; PI and Project coordinator: Antonio Coppola

Description of the legal entity

The UNIBAS Research Unit comes from the University of Basilicata, Department for Agricultural, Forestry, Food and Environmental Sciences (SAFE), Agricultural and Forestry Hydraulics Section. The Department has the main mission to train students committed to innovation and development in agricultural, forestry, food and environmental sectors, to the management and sustainable use of renewable agricultural and forest resources through a distinctive tradition of core-discipline excellence, interdisciplinary collaborations and international partnerships. The disciplinary focus is broad in scope, ranging from individual organisms to natural and managed ecosystems, from agricultural to landscape-based systems. The members of this RU have developed world-renowned expertise in the modelling and measurement of water flow and solute transport in the soil-vegetation-atmosphere continuum in agricultural and environmental systems. Based on these scientific experience, they will specifically address the problem of integrating their own agrohydrological model (FLOWS-HAGES) with the simulation model coming from the CIHEAM-IAM (DAHBSIM) in the NPP-SOL MT

Curriculum vitae

Prof. Antonio Coppola (male), is Full Professor of Agricultural and Forestry Hydraulics at University of Basilicata. Current research focuses on measuring and modeling water and solute transport in unsaturated heterogeneous and layered porous media. Specific topics include: Soil Hydrological characterization; Spatial variability of soil hydrological properties and stochastic approaches in natural porous media; Conceptualization, modelling and prediction of preferential flow velocity, pathways and patterns on forest and agricultural hillslopes; Numerical modelling of soil water and solute transport in the Soil-Plant-Atmosphere continuum system; Irrigation in arid conditions and with non-conventional water resources; Mapping groundwater pollution risk within agricultural watershed using modelling, geostatistics and GIS; Groundwater resources estimates; Forest hillslope hydrology.

2017-2021 – Chair of the I Section (Agricultural Hydraulics) of the ITALIAN ASSOCIATION OF AGRICULTURAL ENGINEERS (AIIA); 2013-2015: Chair of the soil Physics Divison of the EUROPEAN GEOSCIENCES UNION (EGU); Member of the scientific committee of the Hydrological Sciences and of the soil Systems Sciences of the EUROPEAN GEOSCIENCES UNION (EGU); Guest Editor for Journal of Contaminant Hydrology, for the Special Issue entitled: *Transport in preferential flow domains of the soil porous system: Measurement, interpretation, modelling, and upscaling;* Guest Editor for WATER journal, for the Special Issue entitled: *Soil Hydrology in Agriculture*

Dr. Eng. Alessandro Comegna (male) is Associate Professor, Laboratory of Agricultural Hydraulics at University of Basilicata. PhD in Agricultural Hydraulics from the University of Naples "Federico II". The research activity mainly focuses on: i) transport of water and contaminants in natural porous media, ii) spatial variability of hydraulic properties in natural porous media, iii) issues concerning irrigation water quality, iv) issues concerning the agricultural use of wastewaters, v) issues concerning soil pollution by organic pollutants (NAPLs), and vi) sensor design for hydrological and agricultural applications.

Dr. Eng. Vincenzo De Luca (male) is Permanent Researcher, Laboratory of Geographical Information Systems at University of Basilicata. The research activity mainly focuses on: i) Remote and proximal sensing transport of water resources, ii) Using geostatistical analysis approach for identifying aquifer geometry, and water potentiality assessment in arid region.

Publications, and/or products, services relevant to the call content (max 5)

1. Bancheri M., Coppola A., Basile A., 2021. A new transfer function model for the estimation of non-point-source solute travel times. J. of Hydrology. doi.org/10.1016/j.jhydrol.2021.126157
2. Coppola A., K. Smettem, A. Ajeel, A. Saeed, G. Dragonetti, A. Comegna, N. Lamaddalena, A. Vacca, 2016. Calibration of an electromagnetic induction sensor with time-domain reflectometry data to monitor root zone electrical conductivity under saline water irrigation. European Journal of Soil Science, 67, 737–748. doi: 10.1111/ejss.12390
3. Coppola A., A. Comegna, G. Dragonetti, H. H. Gerke, A. Basile, 2015. Simulated Preferential Water Flow and Solute Transport in Shrinking Soils. Vadose Zone J. doi:10.2136/vzj2015.02.0021
4. Coppola A., Comegna A. Dragonetti G., Dyck M., Basile A., Lamaddalena N., Kassab M. and Comegna V., 2011. Solute transport scales in an unsaturated stony soil. Advances in Water Resources. Volume

34, Issue 6, June 2011, Pages 747-759. doi:10.1016/j.advwatres.2011.03.0069
5. Severino, G., Cvetkovic, V., Coppola, A., 2007, Spatial Moments for Colloid-Enhanced Radionuclide Transport in Heterogeneous Aquifers. Advances in Water Resources doi:10.1016/j.advwatres.2006.03.001

Relevant previous projects or activities, connected to the subject of this proposal (max 5)

2018 –Horizon 2020: Development of Integrated Web-Based Land Decision Support System Aiming Towards the Implementation of Policies for Agriculture and Environment - LANDSUPPORT. GA774234;
2016 - ARIMnet2 2014: Salinization in irrigated areas: risk evaluation and prevention – SALTFREE;
2007 - PRIN (Fate of pesticides in soils at field scale). Ref. 2007WA23ZC_003;
2004 - PRIN (Modeling agricultural pollutants dynamics at plot scale). Ref. 2004074597_003;
2002 - PRIN (Research Projects of National Relevance - Italian Ministry of University and Research MUR): (Heavy metals transport in soils irrigated with urban wastewater: Experiments and modeling at the mesoscale). Ref. 2002074287_005

Significant infrastructure and/or technical equipment relevant to the proposed work

Laboratory of Soil and Contaminant Hydrology; Laboratory and field apparatus for soil hydraulic properties determination; Electromagnetic sensors for monitoring water content and salinity (TDR, EMI); Infiltrometers; Multispectral sensors, infrared thermometers; Phreatimeters; Doppler velocity sensors for discharge measurements

Partner: UNICA; PI Stefania Da Pelo

Description of the legal entity

The University of Cagliari (UniCA) is a public research University and the largest Higher Education Institution in Sardinia, Italy. UniCA counts more than 25,000 students, dozens of B.Sc. and M. Sc. programs, 15 PhD programs, 35 specialisation schools, more than 900 academic staff and about the same number of administrative staff. UniCA is organised in 15 Departments and 8 centres (each focused on a specific topic or serving as research infrastructure providing state-of-the-art equipment). Overall, this complex organisation is committed to achieve the UniCA primary goals in research, teaching and third mission, respectively (i) by offering a diverse set of multi-disciplinary education programs, (ii) by performing cutting-edge interdisciplinary research, and (iii) by developing a sustained action toward technology transfer and meeting societal needs of local stakeholders. The members of the RU operate at the Department of Chemical and Geological Sciences (DSCG). The DSCG team integrates transdisciplinary skills in the field of applied geology, hydrogeology, isotope geochemistry, hydrogeochemistry, analytical chemistry, contaminated site characterization, thematic mapping, development of large databases in GIS environment and data analyses. The DSCG team has participated in several local, national, and international research projects, and has a good experience of developing and leading large, complex, and multidisciplinary research projects.

Curriculum vitae

Prof. Stefania Da Pelo (female) is Associate Professor of Applied geology at the DSCG and Vice President of the Faculty of Sciences of UNICA. Her research interests are related to environmental studies addressed to water-rock interaction in active and closed mining areas and in agricultural and industrial areas. The most important scientific results concern (i) development of geo-environmental models for the study of the processes of dispersion of contaminants in surface and groundwater, their quantification and identification of natural mitigation processes, (ii) the geochemical and mineralogical controls on the distribution and the mobility of contaminants in groundwater, (iii) groundwater monitoring network design, (iv) groundwater balance and vulnerability of aquifers (vi) 3D hydrogeological conceptual model reconstruction in porous and fractured aquifers. She holds the role of Secretary of the Italian Chapter of the International Association of Hydrogeologist (IAH).

Prof. Andrea Vacca (male) is Associate Professor of Pedology at the DSCG. His research activity, presented in journals and book chapters and in many national and international scientific meetings, mainly concerned the following topics (ERC research areas: PE10_12 Soil science, PE10_17 Soil pollution): soil degradation (mainly soil contamination and soil erosion) and desertification, soil survey, soil mapping, soil and land evaluation, soil genesis, and humus forms. He coordinated and participated to several national and international research projects, many of which related to the distribution and the mobility of potentially toxic elements in soils. He is author of about 110 scientific papers, 37 of which indexed by Scopus and WOS, and of about 50 abstracts published in proceedings of international and national congresses.

Dr Riccardo Biddau (male) is a technician at the DSCG (Ion chromatography and stable isotopes laboratory). Since his PhD (2003), the main research interests are in the field of environmental geochemistry,

specifically: (i) geochemistry of stable isotope for assessing nitrate source and fate in groundwater using a multiple isotopic approach (H, O, N, B, S); (ii) statistical analysis of geochemical data to evaluate geochemical background of chemical species in groundwaters; (iii) water-rock interaction process and mobility of harmful and toxic elements (Cd, Pb, As, Sb, REE) in surface and groundwater bodies, with special attention to areas interested by past mining; (iv) sorption/desorption processes of arsenic on synthetic and natural contaminated materials (soil/sediments). Author and co-author of 32 full papers in peer-review journals (685 citations and h-index 14 in Scopus, September 2022) and several short papers in conference proceedings.

Dr Francesca Podda (female) is a technician at the DSCG (Emission and Mass Spectroscopy Laboratory). Since her PhD (1995), her main research interests concern the environmental geochemistry and mineralogy, specifically: (i) geochemistry of trace elements in surface and groundwaters bodies; (ii) origin, dispersion processes and fate of metal contaminants in abandoned mining areas (iii) biomineralization processes and the role of biominerals in natural pollution attenuation.

Mr Salvatore Vacca (male) is a technician at the DSCG. His skills are mainly related to sampling of soils and waters, physical characterization of soils, maintenance of field and laboratory devices.

Publications, and/or products, services relevant to the call content

1. Biddau, R., Cidu, R., Da Pelo, S., Carletti, A., Ghiglieri, G., Pittalis, D. (2019) Source and fate of nitrate in contaminated groundwater systems: assessing spatial and temporal variations by hydrogeochemistry and multiple stable isotope tools. Science of the Total Environment, 647, pp. 1121-1136.
2. Pittalis, D., Carrey, R., Da Pelo, S., Carletti, A., Biddau, R., Cidu, R., Celico, F., Soler, A., Ghiglieri, G. (2018). Hydrogeological and multi-isotopic approach to define nitrate pollution and denitrification processes in a coastal aquifer (Sardinia, italy) Hydrogeology Journal, pp. 1-20. doi: 10.1007/s10040-018-1720-7.
3. Da Pelo S., Ghiglieri G., Buttau C., Biddau R., Cuzzocrea C., Funedda A., Carletti A., Vacca S., Cidu R. (2017). Coupling of 3D hydrogeological modelling and geochemical mapping as an innovative approach to support management of aquifers. Italian Journal of Engineering Geology And Environment, vol. special issue 2017, issn: 1825-6635; doi: 10.4408/ijege.2017-01.s-04
4. Ghiglieri, G., Carletti A. Da Pelo S., Cocco F., Funedda A., Loi A., Manta F., Pittalis D. (2016). Three-dimensional hydrogeological reconstruction based on geological depositional model: A case study from the coastal plain of Arborea. Engineering Geology. doi: 10.1016/j.enggeo.2016.04.014
5. Biddau R., Cidu R., Da Pelo S., Ghiglieri G., Carletti A., Pittalis D. (2016). Nitrate occurrence in groundwater hosted in hard-rock aquifers: estimating background values at a regional scale. Italian Journal of Geosciences, vol. 136, ISSN: 2038-1719, doi: 10.3301/IJG.2016.03

Relevant previous projects or activities, connected to the subject of this proposal

- 2021-2025 Project: In-depth geochemical, isotopic and hydrogeological insights into the groundwater bodies in the River Basin District of Sardinia. Granted by the Regional Government of Sardinia (RAS) - POA FSC 2014-2020
- 2019-2022 Project: Geological, hydrogeological and hydrogeochemical insights for the delimitation of the NVZ of some groundwater bodies of Sardinia" Granted by the Regional Government of Sardinia
- 2017-2021 Project: Hydrogeological investigations to assess the quantitative status of the groundwater bodies within the River Basin District of Sardinia, aimed to update the River basin Management Plan of the District of Sardinia. Granted by the Regional Government of Sardinia
- 2016-2020 Project H2020 FLOWERED de-FLuoridation technologies for imprOving quality of WatEr and agRo-animal products along the East African Rift Valley in the context of aDaptation to climate, Granted by the EC
- 2010-2015 KNOW Project Implementing the Knowledge of Nitrogen in Groundwater Granted by R.A.S., LR7/07 CRP 27101

Significant infrastructure and/or technical equipment relevant to the proposed work

The soil, mineralogical, geochemical and water isotopes laboratories support several instruments for the complete characterization of environmental matrix, basically waters and soils (XRD, XRF, ICP-OES, IC, ICP-MS with laser ablation, LA-CRDS) and several equipments for sampling and field surveys (pumping systems, discrete interval sampler, water level data loggers, multi-parametric probes, etc).

Furthermore, the UNICA team provides a formal academic framework to develop training on soil and groundwater resources (WP1). Sharing experiences and global outcomes gained from the partners involved in the project will further increase the background of the UNICA researchers and will serve to promote

capacity building in the young researchers who will be recruited and at the technical structures with expertise in geological matters at the regional level.

Partner: UB; PI Albert Soler Gil

Description of the legal entity

The **Universitat de Barcelona (UB)**, founded in 1450, is a public institution dedicated to higher education and research, which boasts of a student body of 73926 and a research staff of 5963 members. The UB is ranked as the 1st Spanish university in the ARWU ranking 2021 and the 33rd European institution in scientific quality and productivity, managing in average 150 European projects per year, for an amount of about 8,6 M€/year. It is currently involved in 182 projects in H2020, with a net contribution of 66 M€. UB is currently the only Spanish university that is a member of the prestigious League of European Research Universities (LERU) and since 2015 is awarded the HRS4R (Human Resources Strategy for Researchers) logo.

Within UB, the Research Group **"Mineralogia Aplicada, Geoquímica i Geomicrobiologia" (MAG)**, recognized as a consolidated research group and supported by the Catalan Government continuously from 1995 to the present, works on topics related to Geochemistry, Mineralogy, Hydrochemistry, Environmental contamination, and Water-Rock interaction. During the last five years, the group published more than 200 scientific publications (179 in SCI journals) and has participated in 8 European projects.

The Group **"MAiMA - Isòtops estables i Mineralogia"**, being the scientific knowledge and technology transfer section of MAG will be directly involved in NPP-SOL. MAiMA holds an interdisciplinary team of scientists, experts in different scientific areas, such as isotope geochemistry, geochemistry, hydrogeology, hydrology, analytical chemistry, mineralogy and ore deposits. With more than 25 years' experience, it offers customized solutions to problems related to environmental contamination, authentication of agro-alimentary products and mineral durability in civil works to the private sector, public administrations, and society. MAiMA has obtained more than 25 continuous competitive projects from the Spanish Government, 7 European projects, and since 2018 is recognized by the prestigious TECNIO certification from the Government of Catalonia to the most qualified agents involved in technology transfer processes.

The project NPP-SOL will be incorporated in the MAiMA research line on the Environmental impact of rural activities, focused on agricultural pollution sources (nitrate, pesticides). MAiMA main role will be the application of hydrogeochemistry and multi-isotopic tools for the identification of contamination sources and the study of pollutants' fate in the environment, with a special aim in the isotopic characterization of natural and induced attenuation processes, including the assessment of biostimulation of denitrification in the Case Studies.

Curriculum vitae

The MAiMA's personnel involved in NPP-SOL belong to the *Department of Mineralogia, Petrologia i Geologia Aplicada* at the *Facultat de Ciències de la Terra* of the UB:

Prof. Albert Soler (M) (web personal) is Full Professor, Dean of the *Facultat de Ciències de la Terra* at UB and Director of the MAiMA Group. His expertise is related to the application of stable and radiogenic isotopes to geological and environmental investigations. Current research lines are focused on agricultural, urban and industrial pollution sources, with a special aim in the isotopic characterization of natural and induced attenuation processes. He has earned international reputation in the field and has a top-quality scientific record: 124 articles in peer-reviewed journals with more than 3100 citations (h index: 29). He has been the main researcher in more than 55 funded projects and actions to support research, and in more than 70 contracts with companies or public bodies. Since 1990, he has obtained more than 25 continuous competitive projects from the Spanish Government and has gained funding from the EU through 4 projects aside from other international projects.

Dr. Neus Otero (F) (web personal) is Associate Professor. Her expertise is related to the use of isotopic tools to evaluate the fate of contaminants in the environment, with a special focus on natural and induced attenuation of groundwater pollution. She is the current president of the International Association of Geochemistry. She has published 60 articles in SCI journals with 2050 citations (h index: 24), has participated in more than 50 projects and is actively involved in the transfer of scientific achievements to public entities and private companies.

Dr. Clara Torrentó (F) (web personal) is Tenure-track Lecturer. Her research interests are focused on the use of isotopic tools (lab and field studies) to assess the fate of contaminants (e.g. nitrates, Volatile Organic Compounds, pesticides) in groundwater and soils. In 2019, she started a new research line in the Group, focused on demonstrating the applicability of multi-isotopic techniques to assess the fate of pesticides in the

environment. She has published 24 articles in SCI journals, with more than 890 citations (h index: 13) and participated in 21 competitive national and international projects as well as in 35 R&D&I contracts with private companies and administration for the transfer of knowledge.

Dr. Cristina Domènech (F) (web personal) is Associate Professor. Her areas of expertise are geochemical thermodynamics and kinetics of natural waters, reactive transport modelling and groundwater and soil pollution. She worked for more than 10 years in a consultancy developing research, modelling and consulting work on projects related to chemical and geochemical aspects of nuclear and hazardous waste management. She has published 37 articles in SCI journals (more than 630 citations, h index: 15) and several scientific reports, and has participated in more than 50 projects.

Dr. Mònica Rosell (F) (web personal) is Associate Professor. Her expertise relates to the development of analytical methodologies for volatile organic compounds (VOCs), the use of isotopic tools to organic pollutants for determining contamination sources (including CSIA, Compound-Specific stable isotope analysis) and understanding degradation processes in field sites as well as for food authentication. She has published 38 articles (more than 900 citations) in SCI journals (h index: 18) and participated in 43 national and international projects.

Dr. Jordi Palau (M) (web personal) is Tenure-track Lecturer. He is a recognized expert in CSIA application to evaluate the fate and remediation of organic contaminants in contaminated sites. Since 2015 he has also been involved in studies of microbial reduction of iron oxides from metal mine wastes in relation to trace elements biogeochemistry and potential impacts in aquatic environments. He has published 25 articles in SCI journals, with more than 370 citations (h index: 12), and participated in 33 national and international projects.

Publications, and/or products, services relevant to the call content

1. Carrey, R.; Ballesté, E.; Blanch, A.R.; Lucena, F.; Pons, P.; López, J.M.; Rull, M.; Solà, J.; Micola, N.; Fraile, J.; Garrido, T.; Munné, A.; Soler, A.; Otero, N. (2021) Combining multi-isotopic and molecular source tracking methods to identify nitrate pollution sources in surface and groundwater. Water Res, 188, 116537. https://doi.org/10.1016/j.watres.2020.116537
2. Ghiglieri, G.; Buttau, C.; Arras, C.; Funedda, A.; Soler, A.; Barbieri, M.; Carrey, R.; Domènech, C.; Torrentó, C.; Otero, N.; Carletti, A. (2021) Using a multi-disciplinary approach to characterize groundwater systems in arid and semi-arid environments: The case of Biskra and Batna regions (NE Algeria). Sci Total Environ, 757, 143797. https://doi.org/10.1016/j.scitotenv.2020.143797
3. Margalef-Marti, R.; Llovet, A.; Carrey, R.; Ribas, A.; Domene, X.; Mattana, S.; Chin-Pampillo, J.; Mondini, C.; Alcañiz, J.M.; Soler, A.; Otero, N..(2020) Impact of fertilization with pig slurry on the isotopic composition of nitrate retained in soil and leached to groundwater in agricultural areas. In Applied Geochemistry. Volume 125. https://doi.org/10.1016/j.apgeochem.2020.104832
4. Margalef-Marti, R.; Carrey, R.; Merchán, D.; Soler, A.; Causapé, J.; Otero, N. (2019). Feasibility of using rural waste products to increase the denitrification efficiency in a surface flow constructed wetland. Journal of Hydrology, 578, 124035. https://doi.org/10.1016/j.jhydrol.2019.124035
5. Margalef-Marti, R.; Carrey, R.; Soler, A.; Otero, N. (2019). Evaluating the potential use of a dairy industry residue to induce denitrification in polluted water bodies: a flowthrough experiment. J. Environ. Manage. 245. https://doi.org/10.1016/j.jenvman.2019.03.086

Relevant previous projects or activities, connected to the subject of this proposal

- 2022-2026 (Grant Agreement to be signed on October 2022). "UPWATER: Understanding groundwater Pollution to protect and enhance WATER quality". Horizon Europe, Cluster 6.
- 2016-2019. "FLOWERED: de-FLuoridation technologies for imprOving quality of WatEr and agRo-animal products along the East African Rift Valley in the context of aDaptation to climate change". H2020-WATER-5c-2015, Gr.Agr. 690378. www.floweredproject.org
- 2011-2016. "WADIS-MAR: Water Harvesting And Agricultural Techniques In Dry Lands: An Integrated And Sustainable Model In Maghreb Regions". EuropeAid-SWIM.. http://www.wadismar.eu/
- 2019-2021 ISOTOPEST: "ISOtope TOols for assessing PESticide faTe in the environment". H2020-MSCA-IF-2018-837873. https://cordis.europa.eu/project/id/837873
- 2018-2021. "PACE: Attenuation processes of conventional and emerging contaminants from agricultural and industrial sources in waters". Spanish National Plan.

Significant infrastructure and/or technical equipment relevant to the proposed work

MAIMA Group facilities: 3 laboratories with equipment for routine chemical analyses (e.g., spectrophotometer, lyophilizer) and preparation of environmental samples for bulk stable isotope analysis of C, N, S, Cl, H, O for a wide variety of applications, and compound specific isotopic analysis (CSIA).

Specific methodologies for extraction/preconcentration of different compounds in different matrices. Sampling equipment for field sampling and in situ measurements of hydrochemical parameters: pumping systems, water level data loggers, multi-parametric probes, etc. www.ub.edu/maima
Scientific and Technological Centres of the UB (CCiT-UB): Isotope Ratio Mass Spectrometry Unit equipped with several IRMS for isotopic analysis, including: EA-TC-IRMS, GasBench-IRMS, DI-IRMS, EA-IRMS, GC-IRMS, HPLC-IRMS, GasBench-PRECON-IRMS, L-CRDS. MAiMA contributes with the acquisition of instrumentation and the development of the isotopic methods. www.ccit.ub.edu
Faculty of Earth Sciences (UB) and the Scientific and Technological Centers of the UB (CCiT-UB): dual infrastructure LIRA – PANTHALASSA to study the trace of radiogenic and environmental isotopes. The new Laboratory of Radiogenic and Environmental Isotopes (LIRA) aims to work on chemical preparation and process of all samples to be later analysed in the PANTHALASSA spectrometer.

Partner: CIHEAM-IAM; PI **Hatem Belhouchette**

Description of the legal entity
CIHEAM-IAM is an Institute of the International Centre for Advanced Mediterranean Agronomic Studies, with an inter-governmental mandate in research, education and development, an expertise in qualitative and quantitative research methods in sustainable agriculture and long-standing partnerships with other consortium members throughout the Mediterranean region.

Curriculum vitae
Dr. Hatem Belhouchette (male) Scientific Administrator (MSc. in irrigation, PhD Agronomy). His main expertise and interest are the development, in a participatory approach, of operational methods for the assessment, exploration and design of Mediterranean agricultural production systems at farm and regional levels, as well as, the development of tools for social acceptability analysis. He is presently coordinating research network that aims at the development of a system for agro-economic and environmental modelling. He ran several national and international research projects and supervises several Master and PhDs projects mainly on farming resilience analysis under climate change and market uncertainty topics. He is currently associate professor-researcher in the UMR-System.
Dr. Georgios Kleftodimos (male):. Scientific Administrator (MSc in Economy and PhD Agricultural Economy). He is an agro-economist specialist in analyzing of resilience of farming systems in the Mediterranean. He has a large experience in developing household bio-economic model based on linear programming. He was involved, since many years, in many national and international projects.
Eng. Nicola Lamaddalena (male)
He has over 30 years of professional experience in the agricultural engineering and water resources management, with a focus on: the implementation of feasibility and detailed design studies for irrigation/ agriculture projects; performance analysis and management of large scale network distribution systems under several operating conditions; evaluation of the equity of the system; identification of solutions for improvements; delivery of advanced technologies with associate modeling development under water scarcity conditions.
Dr. Alessandra Scardigno (female): Since 1997 she accomplishes research and teaching activities in the fields of irrigated agriculture economics, agricultural and environment policy and economics of water resources. The research activity mainly focuses on: bio-economic modelling approach as a tool to analyze the interactions between agriculture, natural resources and environment and to evaluate the sustainability of water policies in the Mediterranean countries and impacts of climate change on water resources use in Mediterranean agriculture.
Dr. Laura Scivetti (female): She has been working for the CIHEAM Bari since 2006. Instructional Designer and Communication Expert in the E-learning Courses carried out by CIHEAM Bari in the frame of several projects funded by the Italian Ministry of Foreign Affairs and since 2015 as Communication Manager and Strategist in national and international projects and events. The communication activity mainly focuses on: planning and implementation of integrated communication strategies; management of all the institutional social media accounts on Facebook, Twitter, LinkedIn, Instagram, YouTube; contents management, design and editing of multimedia communication materials.

Publications, and/or products, services relevant to the call content

1. L.El Ansari, R. Chenoune, Y.A. Yigezu, C. Gary and H. Belhouchette. 2021. Trade-Offs between
2. Sustainability Indicators in Response to the Production Choices of Different Farm Household Types in Drylands. Agronomy 2020, 10, 998; doi:10.3390/agronomy10070998
3. Kleftodimos G., Gallai N., Rozakis S., Kephaliacos Ch. "A farm-level ecological-economic approach of the inclusion of pollination services in arable crop farms", Land use Policy, Volume 107, 2021, https://doi.org/10.1016/j.landusepol.2021.105462.
4. Kleftodimos, G.; Kyrgiakos, L.S.; Kleisiari, C.; Tagarakis, A.C.; Bochtis, D. Examining Farmers ' Adoption Decisions towards Precision-Agricultural Practices in Greek Dairy Cattle Farms. 2022.
5. R.H. Mohtar, E. Braudeau, H. Belhouchette. Preface: Multi-scale water and land-use modelling for better decision making in agro-eco systems. Computers and Electronics in Agriculture, Elsevier, 2012, 86, pp.1-3.

Relevant previous projects or activities, connected to the subject of this proposal

- SupMed (FFEM project led by H. Belhouchette) Stratégies collectives et contextualisées pour promouvoir une production agricole résiliente et durable dans les zones rurales Méditerranéennes.
- SemiArid (ArimNet project led by H. Belhouchette) Sustainable and Efficient Mediterranean farming systems: Improving Agriculture Resilience through Irrigation and Diversification.
- HASAD (FIDA project led by H. Belhouchette) Hilly Areas Sustainable Agricultural Development
- Project. Reducing rural poverty by substantially increasing the agricultural productivity and income of targeted households in Lebanon.
- AgreeMed (PRIMA S2 (2021) H. Belhouchette WP leader) Innovative Aquifers Governance for Resilient Water Management and Sustainable Ecosystems in Stressed Mediterranean Agricultural Areas
- EXCEL4MED (HORIZON 2022 G. Kleftodimos WP leader) Excellence hub in green technologies: Introducing innovation ecosystems in the Mediterranean food value chain

Significant infrastructure and/or technical equipment relevant to the proposed work

A unique platform for integrated impact analysis and stakeholder's involvement. This platform combines different tools/models for the assessment in a participatory approach of the sustainability and resilience of Mediterranean agro-ecosystems and the governance of rural territories seen as a concerted and reasoned development of rural areas.

Partner: ARO; PI (*name and surname*) Roy Posmanik

Description of the legal entity

The Agricultural Research Organization (ARO) – Volcani institute is a governmental research institute dedicated to the highest quality of basic and applied research in agricultural and environmental science. Volcani is the largest institute for Agricultural and Environmental research in Israel. ARO's scientific findings and leadership in agricultural research has driven more than 80% of agricultural advances in Israel and contributed to progress in life sciences globally. Furthermore, Volcani innovations, perhaps most impressively, surpass country borders and diplomatic relations to impact populations and quality of human life all around the world. ARO's six institutes are dedicated to distinct subjects in Plant Sciences, Animal Science, Plant Protection, Soil, Water and Environmental Sciences, Agricultural Engineering, and Postharvest and Food Sciences.

The ARO: Strives to foster and advance agriculture, environmental quality, and involvement of the relevant industries in Israel, through the integration of practical and basic research; Encourages research and development initiatives based on original thinking and creativity, identifies gaps in knowledge, and opens new avenues in agricultural research; Advises the Ministry of Agriculture and Rural Development and the Government of Israel on agricultural and environmental research, development, training, and planning; Endeavours to publish its research findings in the scientific and professional literature and to exploit these findings in cooperation with the business sector and with other research organisations; Participates in the guidance of trainees and the instruction of students, in coordination with institutions of higher learning in Israel and worldwide, to establish the next generation of agricultural researchers.

Model Farm for Sustainable Agriculture:

At the beginning of 2018, the "Model Farm for Sustainable Agriculture" was set up at the Newe Ya'ar Research Centre, in order to examine, demonstrate and disseminate among farmers the principles of Sustainable Agriculture.

Curriculum vitae

Dr. Roy Posmanik (male) is a research scientist at the Institute of Soil, Water & Environmental Sciences, Agricultural Research Organization - Volcani Institute. His laboratory, the "*Waste to Resource Lab*" focuses on the recovery of renewable energy, bio-based chemicals and agricultural nutrients from agro-waste streams, while minimising their carbon footprints. In his research, Dr. Posmanik asks fundamental and applied questions aimed to develop sustainable processes by integrating biological and thermo-chemical pathways to recover valuable resources from agricultural waste streams. In his work, Dr. Posmanik collaborates with research scientists from different disciplines, aiming to maximise resource recovery from agro-waste streams while minimising their effect on the environment including soil and water bodies. As a part of the "*Model Farm*" team Dr. Posmanik demonstrates the recovery of nutrients from agro-waste systems including the evaluation of the carbon footprint of waste management practices.

Dr. Yael Laor (female) is a senior research scientist at the Institute of Soil, Water and Environmental Science, ARO, Israel. Her research activity is focused on composting processes, including lab-scale simulations, process control, pathogen survival, compost quality and maturity. In addition, Dr. Laor is a lead scientist in the field of odor emissions to the environment including sampling and analyses of odors and volatile organic compounds (VOCs) emitted from animal feeding operations and waste treatment plants. During the past five years, Dr. Laor is the head of the scientific committee of the multidisciplinary "*Model Farm*" project, aiming to study, demonstrate and assimilate key principles of sustainable agriculture.

Dr. Matat Zohar (female) is the manager of the "*Waste to Resource Lab*" since 2019. Matat holds a PhD in biology from Ben Gurion University of the Negev and join the ARO at 2012. She is working on the integration between waste management and plant development.

Publications, and/or products, services relevant to the call content

1. Angenent LT, Usack JG, Xu J, Hafenbradl D, **Posmanik R**, Tester JW (2018). Integrating electrochemical, biological, physical, and thermochemical process units to expand the applicability of anaerobic digestion. Bioresource Technology 247, 1085–1094.
2. Usack JG, Gerber Van Doren L, **Posmanik R**, Labatut RA, Tester JW, Angenent LT (2018). An evaluation of anaerobic co-digestion implementation on New York State dairy farms using an environmental and economic life-cycle framework. Applied Energy 211, 28–40.
3. Kassem N, Sills DL, **Posmanik R**, Blair C, Tester JW (2020). Combining anaerobic digestion and hydrothermal liquefaction in the conversion of dairy waste into energy: a techno economic model for New York State. Waste Management, 103, 228–239.
4. Belete YZ, Mau, V, Spitzer Yahav R, **Posmanik R**, Jassby D, Iddya A, Kassem N, Tester JW, Gross A (2021). Hydrothermal carbonization of anaerobic digestate and manure from a dairy farm on energy recovery and the fate of nutrients. Bioresource Technology 333, 125164.
5. Kumar S, **Posmanik R**, Spatari S, Ujor, VC (2022). Repurposing anaerobic digestate for economical biomanufacturing and water recovery. Applied Microbiology and Biotechnology 106, 1419–1434.

Relevant previous projects or activities, connected to the subject of this proposal

- 2021-2025 MERC-USAID, Sustainable reuse of biosolids
- 2021-2022 GIF, Anaerobic degradation of environmental pollutants
- 2021-2024 ISRAEL Ministry of Agriculture, Nutrient recovery from anaerobic digestate
- 2021-2024 Israel Dairy Board, Treatment of manure digesate
- 2022-2024 CFPN, P recovery from anaerobic digestate

Significant infrastructure and/or technical equipment relevant to the proposed work

The *Waste to Resource Lab* at the Neve Ya'ar research centre (ARO), Israel, is well equipped to characterize organic effluents. This includes a CHNS/O analyser, a UV-VIS spectrophotometer, a flame photometer, TOC analyser, a furnace oven, solid phase extraction (SPE) and liquid-liquid extraction system. In addition, Neve Ya'ar Research Centre is equipped with the relevant analytical facilities including scanning electron microscopy (SEM), HPLC, GC-MS, LC-Q-TOF and FTIR.

Partner: MOAG; PI (*name and surname*) Roey Egozi

Description of the legal entity

The SERS-MOAG is the Soil Erosion Research Station – the R&D unit of the Department of Soil Conservation and Drainage at the Ministry of Agriculture & Rural Development, Israel. Its main objective

is to run and lead applied research projects to advance sustainable agriculture and integrative watershed and flood management. This task is led by researchers with diverse backgrounds including hydrology & geomorphology, soil sciences, and ecology. They are leading experts in their field and well experienced in integrating together "knowing how" and "doing how" science-based practices. Their applied research projects span the whole country i.e. working together with scientists, farmers, and drainage basin authorities. The research projects are heavily field-based projects. However, the researchers use diverse methodologies from in-situ advanced monitoring systems to UAVs' remote sensing and GIS application as well as modelling.

Curriculum vitae

Dr. Roey Egozi (male) is an experienced hydro-geomorphologist serving as the chief research hydrologist at SERS. In his current role, he oversees the Soil Erosion Research Station's hydrological and geomorphological R&D missions. He has expertise in hydro-geomorphological processes, such as sediment transport, runoff, and river flows, soil conservation and sustainable integrated watershed management. His current research projects focus on the hydro-geomorphological effects of land use and land cover changes (LULCC), such as agriculture, urban, and forested areas, over a range of physiographic regions (e.g., coastal areas, lowlands, and mountains), mainly in Israel. He leads an eco-hydrological restoration of the upper Nahalal Stream as part of the Model Farm, to improve the riverine-agriculture environment interface. In addition, he served for two years as Israel's focal representative for EU-GSP and FAO-GSP (Global Soil Partnership)

Matan Ben Yona (male) – Research Engineer at the Soil Erosion Research Station

Mr. Ben Yona is a hydrologist working on a range of hydrological issues at the watershed scale: runoff/rainfall relations; designed discharges for soil conservation and river restoration projects; water quality datasets analysis; the impact of land use and land cover changes on runoff routing; geomorphometry of drainage basins. He is an expert in hydrological modeling, and spatial analysis (GIS) and a skilled programmer in Python and R.

Elazar Volk (male) – Prevention of Soil Erosion and Salinity at the Soil Erosion Research Station Officer - He is a hydrogeologist who aims at understanding soil salinization processes. He works on spatial and temporal monitoring of soil salinization in the saturated and unsaturated zone. He utilizes soil sampling and observation wells and a variety of complementary tools(e.g. models & GIS) to describe salinization processes and water movement in soil salinization areas.

Publications, and/or products, services relevant to the call content

1. Eshel, G., Unc, A., Egozi, R., Shakartchy, E., Doniger, T., Steinberger, Y. and Adams, J., 2021. Orchard-floor management effect on soil free-living nematode communities. Soil Research.
2. Letz, O.*, Siebner, H., Avrahamov, N., Egozi, R., Eshel, G. and Dahan, O., 2021. The impact of geomorphology on groundwater recharge in a semi-arid mountainous area. Journal of Hydrology, 603, p.127029.
3. Bekin, N.*, Prois, Y., Laronne, J.B. and Egozi, R., 2021. The fuzzy effect of soil conservation practices on runoff and sediment yield from agricultural lands at the catchment scale. Catena, 207, p.105710.
4. Topaz, T.*, Egozi R., Eshel G., Chfetz B. 2018. Pesticides load dynamics during stormwater flow events in Mediterranean coastal streams: Alexander stream case study. Science of The Total Environment **625**:168-177. DOI: 10.1016/j.scitotenv.2017.12.213
5. Eshel, G., Egozi R., Goldwasser Y., Kashti Y., Fine P., Hayut E., Kazukro H., Rubin B., Dar Z., Keisar O., DiSegni D. 2015. Benefits of growing potatoes under cover crops in a Mediterranean climate. Agriculture, Ecosystems, and Environment **211**: 1-9.

Relevant previous projects or activities, connected to the subject of this proposal

- 2020 – 2026 Open Land Fund. Eco-hydrological restoration of the agricultural Nahalal Stream
- 2020 – 2021 Israel Ministry of Agriculture. The feasibility of applying nature-based solutions for flood mitigation of IL streams & floodplains: Marrying hydro-morphological analysis with considerations of agricultural property rights
- 2017 – 2019 Israel Ministry of Agriculture. Developing a National Spectroscopy Library for Israel Soils.
- 2018 – 2019 Nekodat-Hen. Economical assessment of ecosystem services provided by rivers floodplain. Demonstrated on Yitzhak Stream, Taninim Stream & Tzipori Stream case studies.
- 2017 – 2018 Nekodat-Hen. Eco-hydro-geomorphological assessment of river restoration project – Tzipori Stream as a case study.

Significant infrastructure and/or technical equipment relevant to the proposed work

Water quality field laboratory; portable and stationary monitoring equipment for water quality and quantity

Partner: INRA; PI Abdelmjid Zouahri

Description of the legal entity

The National Institute of Agronomic Research "INRA" has the mission to undertake research for agricultural development. It is a public institution whose origins date back to 1914 with the creation of the first official agricultural research services. It recently underwent a structural reorganization aimed at modernizing its management process. INRA operates through ten regional agronomic research centres and 23 experimental stations spread over the national territory and covering the various agro-systems of the country. The INRA's main activities concern : To carry out scientific and technical research aimed at the development of agriculture and animal husbandry; To carry out prospective studies relating to the natural environment or which have the improvement of plant or animal production; To undertake trials on the crops to be improved as well as on animal production and, in general, to carry out all experimental actions of an agricultural nature or those concerning the development of processes for the transformation and use of plant and animal products.

Curriculum vitae

Prof. Abdelmjid Zouahri (male) –

Director of Research at INRA, Ph.D. in Chemical Sciences in 2007, from Ibn Tofail University of Kenitra with a specialization in soil and water chemistry. He has been a researcher at INRA Rabat since 1997, specialized in soil and water chemistry and head of soil, water and plant analysis laboratory for 20 years, coordinator of Research Unit on Environment and Conservation of Natural Resources in the Regional Center of Agricultural Research of Rabat, INRA-Morocco. Author of about 60 international publications and 80 communications. He is involved in many projects at national and international level (Prima, Eranetmed, AIEA, OCP…). of Morocco, funded by OCP and MADRPMEF.

Dr Beniken Lhou

Crop water requirements, Response of plants to abiotic stress (water stress), Crop irrigation, Management and programming of crop watering, Optimization of crop irrigation, Study of the water relations of the soil-plant system, Studies of abiotic stress on rootstocks and variety/rootstock associations in citrus

Dr Dakak Houria

Water quality, Hydrology, Conservation of Natural ressources

Ms El Omari Fatimazahra

Plant Nutrition, Agriculture, Crop Production, Nutrient Management, Horticulture.

Publications, and/or products, services relevant to the call content

1. Serine OMRANIA, Najib EL KHODRANI, Mbark LAHMAR, Ahmed DOUAIK, Hamza IAAICH, Souad EL HAJJAJI, Abdelmjid ZOUAHRI (2021). Seasonal variation of heavy metal pollution of groundwater and soil in the M'nasra Region (Gharb, Morocco). Journal of Experimental Biology and Agricultural Sciences, 2021; Volume –9(6) page 813–822
2. Yousra El Mouine, Amal El Hamdi, Moad Morarech , Ilias Kacimi , Abdelmajid Zouahri , Hasna Yachou and Houria Dakak (2021). Landfill Pollution Plume Survey in the Moroccan Tadla Using Spontaneous Potential .Published: 26 March 2021, Water 2021, 13(7), 910; https://doi.org/10.3390/w13070910.
3. El Hasini, S. , Iben. Halima O., El. Azzouzi M. , Douaik A., Azim K. , Zouahri A, 2019 : Organic and inorganic remediation of soils affected by salinity in the Sebkha of Sed El Mesjoune – Marrakech (Morocco), Soil and Tillage Research 193 (2019) , pp 153-160.
4. El Oumlouki K, Moussadek R, Douaik A, Iaaich H, Dakak H, Chati MT, Ghanimi A, El Midaoui A, El Amrani M et Zouahri A. (2018). Assessment of the groundwater salinity used for irrigation and risks of soil degradation in Souss-Massa, Morocco. Irrigation and Drainage, 67 (suppl. 1): 38–51.
5. El Khodrani N, Zouahri A, Douaik A, Omrania S, Iaaich H, Yahyaoui A, Fekhaoui M. 2017. Evaluation the Impact of Intensive Agriculture on Physic- Chemical Properties of Soil and Groundwater in the Rural Commune Sfafaa(Sidi Slimane, Gharb, Morocco). Journal of Materials and Environmental Science. 7 (8): 2339-2346

Relevant previous projects or activities, connected to the subject of this proposal

- PRIMA REAC4MED "Inclusive Outscaling of Agro-ecosystem REstoration ACTions for the MEDiterranean (2021-2024),
- Projet ERANETMED FP7 (Decentralized treatment wetlands for sustainable water management in rural and remote areas of semi-arid regions) pour la période 2020 - 2023
- Project on the elaboration of fertility map of Morocco, funded by OCP and MADRPMEF(2010- 2018)

Significant infrastructure and/or technical equipment relevant to the proposed work
Water analysis laboratories; Soil analysis laboratories; AAS, CNHSO, CPG

Partner: UM5; PI (*name and surname*) Souad El Hajjaji

Description of the legal entity

The Mohammed V University of Rabat (UM5) was founded in 1957. It is one of oldest universities of Morocco. The University of Rabat has 18 establishments (8 Faculties, 5 Schools, 5 Institutes). The UM5R offers 259 programs in Undergraduate and Master level, in addition to 45 doctorate programs where 7767 PhD student are enrolled. The University of Rabat set up 52 accredited research structures (19 research centers, 11 laboratories and 22 Research teams), 9 centers of doctoral studies, and a city of Innovation. In the period of 2015-2018 the University Mohammed V of Rabat registered 212 patents on a national and international scale.

In this proposal, UM5 is represented by the research centre in Water, natural resource, environment, and sustainable development (CERNE2D). CERNE2D has expertise in environment and valorisation of natural resources (water, plants, waste,…). It has developed much research in water quality monitoring in terms of organic and inorganic pollutants' levels, pesticides' residues, heavy metals, bacteriological quality, and the main characteristic for water used for irrigation, assessment of the groundwater resources quality and wastewater treatment issues (wetlands, adsorption, photocatalysis, biosorption, etc.). Other research is done on extraction process. CERNE2D is a research centre in environmental sciences, partner of projects PRIMA, ERANETHMED, PHC, etc.

Curriculum vitae

Prof. Dr. Souad El Hajjaji (**Female**) is currently Professor of Material, Water & Environmental Sciences at the University Mohammed V in Rabat. She carried out her international academic and research career in universities in France, Germany, and Morocco. In 2017, she was nominated as a director of the research centre on water, natural resources, environment, and sustainable development (CERNE2D) at the University Mohammed V. Her research is devoted to the development of new process of extraction of: oils and extracts, valorization of national plants for different applications (insecticides, antioxidants, anti-inflammatory, ..); new processes for wastewater treatments (wetlands, adsorption, photodegradation, electrochemistry….), solid waste valorisation, monitoring of pesticides and emergent pollutants in water and soil (POPs), the management of water resources, reuse of treated wastewater in agriculture and the impact studies of waste on the quality of water resources. She has coordinated several research projects at different levels: i) National ii) bilateral cooperation with different countries (Germany, Spain, France, Sweden, Jordan, Tunisia, Egypt, Algeria, etc.) and iii) European Projects (PRIMA, ERANETHMED).

Pr Najoua Labjar (**Female**) holds a master's degree in science and technology, specializing in analytical techniques and quality control, then a diploma of advanced study specializing in materials science and process engineering and a national doctorate in materials science. Currently, Prof. Najoua LABJAR is professor at ENSAM- Université Mohammed V, Rabat, Morocco. Prof. Najoua LABJAR has approached several research fields in relation with material sciences, water and waste valorization and treatment. Thus, she is currently author and co-author of more than 35 publications and indexed book chapters. Prof Najoua LABJAR is also working on the application of life cycle assessment approaches, particularly for the monitoring and evaluation of environmental impacts.

Prof. Dr. Abdelmalek DAHCHOUR (**male**) received his PhD in pesticide Chemistry from Imperial college in London (UK), Doctorate of 3 cycle in physical chemistry from University of Bourgogne (F), License (BSc) in chemistry from university of Mohammed V (Morocco). The main topics approached by Prof. Dahchour are associated with behavior of pesticides in the environment, treatment of water and preparation of natural adsorbent products. Beside of his academic work at Agronomy institute, he was appointed 2 times as vice director of this institute. Prof. Dahchour has several published papers on behavior of pesticides and wastewater issue.

Publications, and/or products, services relevant to the call content

1. Aboubakar, A., Douaik, A., Mewouo, Y.C.M., Madong, R.C.B.A., Dahchour, A., El Hajjaji, S. Determination of background values and assessment of pollution and ecological risk of heavy metals in urban agricultural soils of Yaoundé, Cameroon (2021) Journal of Soils and Sediments, 21 (3), pp. 1437-1454.

2. Necibi, M.C., Dhiba, D., El Hajjaji, S. Contaminants of emerging concern in african wastewater effluents: Occurrence, impact and removal technologies (2021) Sustainability (Switzerland), 13 (3), art. no. 1125, pp. 1-12.
3. Aboubakar, A., El Hajjaji, S., Douaik, A., Mfopou Mewouo, Y.C., Birang a Madong, R.C., Dahchour, A., Mabrouki, J., Labjar, N. Heavy metal concentrations in soils and two vegetable crops (Corchorus olitorius and Solanum nigrum L.), their transfer from soil to vegetables and potential human health risks assessment at selected urban market gardens of Yaoundé, Cameroon (2021) International Journal of Environmental Analytical Chemistry.
4. Mabrouki, J., Azrour, M., Farhaoui, Y., El Hajjaji, S. Intelligent System for Monitoring and Detecting Water Quality (2020) Lecture Notes in Networks and Systems, 81, pp. 172-182.
5. M Hdidou, MC Necibi, J Labille, S El Hajjaji, D Dhiba, Potential use of constructed wetland systems for rural sanitation and wastewater reuse in agriculture in the Moroccan context, Energies, 2021.

- PRIMA (2021), MEDiterranean alliance for ecological PEST management, (1.00000 euros)
- Project about biochars, Waste treatment, with Stina Jansson, PhD, Assoc.Prof. Department of Chemistry, Umeå University, SE-901 87 Umeå, Sweden. L'afrique du sud (Durban), (2019-2023);
- ERANETHMED (With Germany, Tunisia and Egypt/ Morocco (UM5R, IAV Hassan II, INRA), Decentralized treatment wetlands for sustainable water management rural areas of semi-arid regions, (2018-2022);
- Project on Artificial intelligence, Development of an intelligent system for monitoring and detecting the quality of water (2021 – 2023)
- Multithématique project 'Nouvelles Technologies 3D de traitement des eaux usées par des photocatalyseurs solaires à base de matériaux hybrides' (350000 euros) (2022-2025)

Significant infrastructure and/or technical equipment relevant to the proposed work

Platform for water analysis (DCO, DBO5, TDS, N, P, pH, Dissolved oxygen, ….), Systems for extraction and analysis, HPLC, GC/MS, DRX, SEM, IR, UV-vis, Fluorescence X, TEM, BET, ATG, DC

4.2. Third parties involved in the project (including use of third party resources)

No third parties involved

Section 5: Ethics and Security

5.1 Ethics

We did not enter any ethics issues in the ethical issue table in the administrative proposal forms

5.2 Security[12]

Please indicate if your project will involve:

☐ activities or results raising security issues: (NO)
☐ 'EU-classified information' as background or results: (NO)

[12] See article 37 of the PRIMA Model Grant Agreement