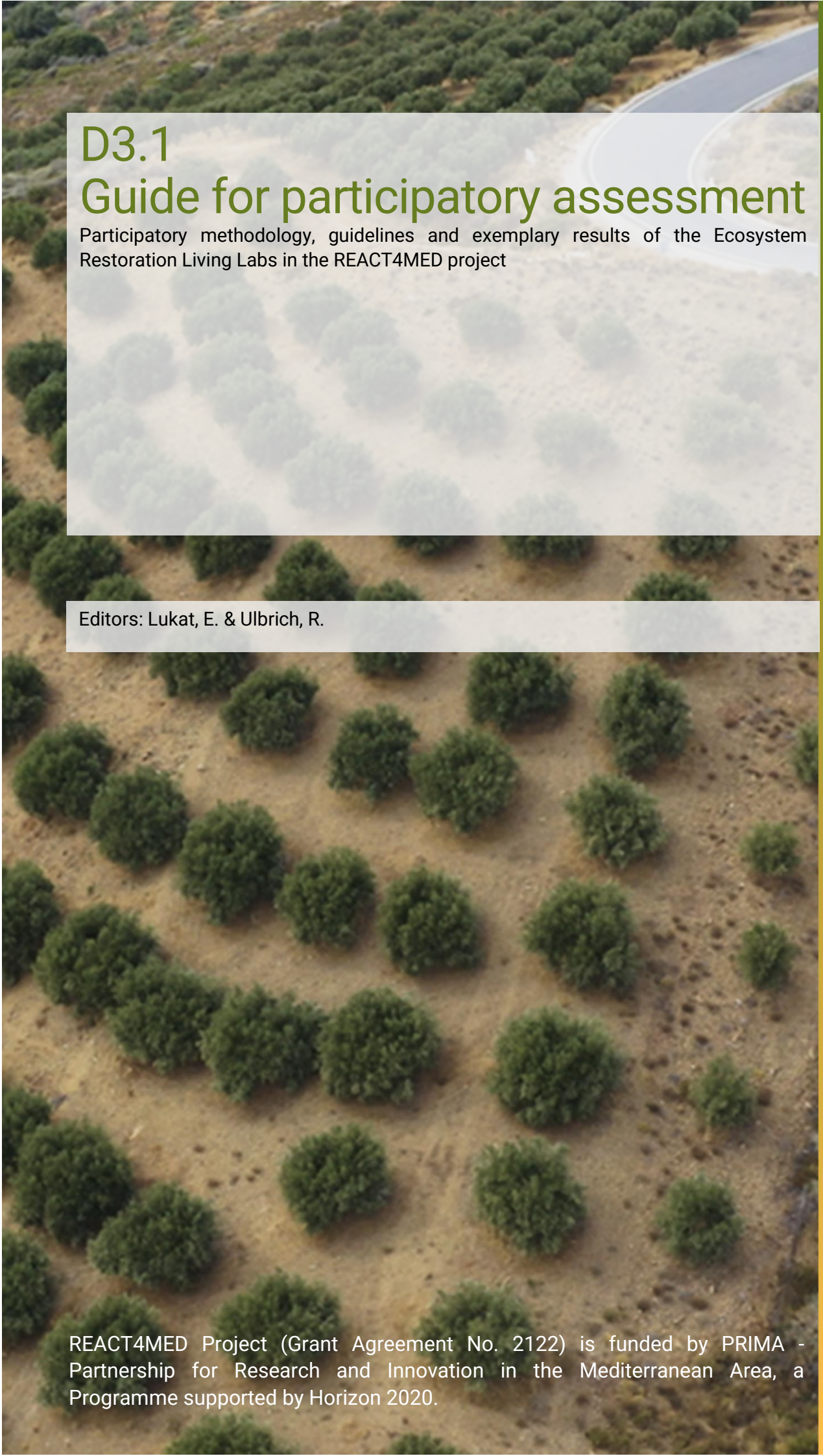

D3.1
Guide for participatory assessment

Participatory methodology, guidelines and exemplary results of the Ecosystem Restoration Living Labs in the REACT4MED project

Editors: Lukat, E. & Ulbrich, R.

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Contents

List of acronyms

CA: Conservation Agriculture
CAP: Common Agriculture Policy
CIHEAM Bari: Istituto Agronomico Mediterraneo di Bari
CY: Cyprus
CyI: The Cyprus Institute
D: Deliverable
DoA: Description of Action
EG: Egypt
ES: Spain
ERLL: Ecosystem Restoration Living Lab
GR: Greece
HMU: Hellenic Mediterranean University
IL: Israel
INRA: Institut National de la Recherche Agronomique
IT: Italy
LanDS: Land degradation Decision-Support
M: Month
MO: Morocco
MS: Milestone
NGO: Non-Governmental Organisation
PA: Pilot Area
PAL: Pilot Area Leader
PDS: Participatory Development Solutions
PP: Project Partners
PRIMA: Partnership for Research and Innovation in the Mediterranean Area
SH: Stakeholder
SOFTW: SoftWater s.r.l.
TR: Turkey
TUC: Technical University of Crete
UH: University of Haifa
UOS: Osnabrück University
UTAEM: Turkish International Agricultural Research and Training Center
UV: Universidad de Valencia
WP: Work Package
WS: Workshop

Executive Summary

The REACT4MED project addresses the challenges of land degradation and desertification in Mediterranean arid and semiarid agro-ecosystems, recognising the long-term anthropogenic pressure on agricultural lands. The project aims to enhance sustainable land and water management to support increased agropastoral productivity, accelerate technological innovation and dissemination, reverse land degradation, and improve the livelihoods of Mediterranean communities. A central component to support this goal is the applied Living Lab format.

As such, eight Ecosystem Restoration Living Labs (ERLLs) are established and facilitate collaboration among stakeholders in eight Mediterranean Pilot Areas (PAs) to co-create and test innovative solutions that address the challenges of land degradation and desertification in Mediterranean agro-ecosystems. This guide for participatory assessment illustrates the participatory approach chosen for the implementation of the ERLLs in the PAs. In Chapter 2, it first presents the definition of the Living Lab format and its application in REACT4MED. Then, the roles that different stakeholders - scientific and non-scientific stakeholders alike – tend to take on in transdisciplinary research are reflected upon in the context of REACT4MED. Addressed next are aims and activities of the ERLLs as well as the status of stakeholder engagement in REACT4MED at the outset of the project. Chapter 3 describes the specificities of the eight PAs in terms of the background and problem situation, the restoration action as focussed on in REACT4MED, as well as the relevant stakeholders. Finally, in Chapter 4, the participatory assessment pathway is escribed in detail. It outlines the activities carried out within the ERLLs and will be iteratively developed throughout the project. Ultimately, this guide will illustrate the entire participatory process chosen to assess opportunities and barriers in REACT4MED and build suitable capacities for the up- and outscaling of the restoration actions.

The Living Lab methodology offers a promising opportunity to move towards a sustainable agriculture and agri-food system, with the goal of developing robust and solution-oriented technical and social innovations towards a sustainable agricultural system. The report provides a comprehensive overview of the participatory approach of the REACT4MED project and its methodology applied to achieve its objectives to enhance sustainable land and water management in the arid and semiarid agro-ecosystems of the Mediterranean region.

1 Introduction

The REACT4MED (Inclusive outscaling of agro-ecosystem **RE**storation **ACT**ions **for** the **MED**iterranean) project addresses the challenges of land degradation and desertification in Mediterranean arid and semiarid agro-ecosystems. The project recognises the long-term anthropogenic pressure on agricultural lands. Combined with abiotic factors and frequent extreme events, this has created an uncertain and unstable living environment that threatens the sustainability of agriculture and the livelihoods of Mediterranean communities.

The project draws on two conceptual directions to achieve its objectives. The first is a top-down approach that introduces broad-scale concepts, methods and data to highlight good, cost-effective restoration actions against land, water, and agro-ecosystem degradation, as well as physical vulnerabilities. The second is a bottom-up, multi-actor approach that seeks to establish a solid basis for collaboration with identified stakeholders in order to overcome barriers to the application of restoration actions and to support their substantial out-scaling.

The project's primary goal is to enhance sustainable land and water management to support increased agropastoral productivity, accelerate technological innovation and dissemination, reverse land degradation, and, thus, improve the livelihoods of Mediterranean communities. By achieving these objectives, the REACT4MED consortium aims to mitigate the threats posed by land degradation and desertification to the present and future of Mediterranean arid and semiarid agro-ecosystems.

Within its Work Package (WP) 3, the REACT4MED consortium implements a living lab approach to foster the implementation of sustainable agricultural techniques. Due to the complexity and multifaceted nature of agro-ecosystems, living labs in the context of agriculture face unique challenges and opportunities. Agro-ecosystem living labs need to deal with ecological, economic, social as well as political aspects in an integrative manner. By engaging various stakeholder groups in a concerted and interactive effort, the implementation of the living lab approach in agro-ecosystems offers a promising opportunity to move towards a sustainable agriculture and agri-food system. The aim of this deliverable is to present the methodology applied within the Ecosystem Restoration Living Labs (ERLLs) by which stakeholders are encouraged and supported in the eight Pilot Areas (PAs) throughout the Mediterranean (Figure 1). The methodology allows to co-create and share knowledge across sectoral boundaries and to develop robust and solution-oriented technical and social innovations towards a sustainable agricultural system.

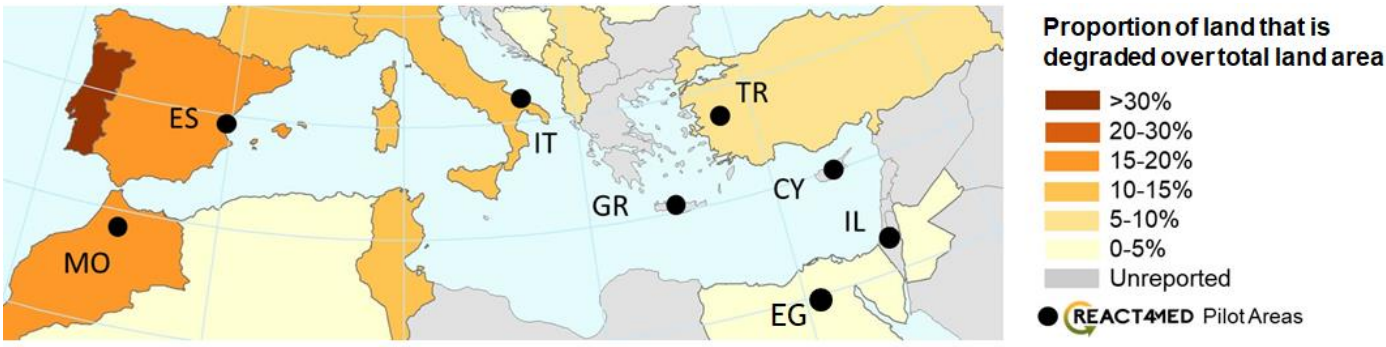

Figure 1: Locations of the eight Pilot Areas in the REACT4MED project in relation to proportion of total degraded land area.

Transdisciplinary research inherently necessitates continuous observation and reflection on role perceptions, interests, power relations and different understandings among researchers and stakeholders alike. Illustrating the transdisciplinary nature of the REACT4MED project, the report itself presents a process, or rather, a learning journey. At several instances, the consortium reflected on its approaches, expectations and interactions with its stakeholders. These instances are also described in the following.

This report provides an overview of the Living Lab methodology and its application in the REACT4MED project. First, the conceptualisation of ERLLs in the REACT4MED project is presented. It includes a definition of ERLLs as well as an illustration of the consortium's familiarity with and understanding of the stakeholder engagement in REACT4MED at the outset of the project. This section also outlines the aims and activities of the ERLLs, as well as a first reflection on roles of participants in transdisciplinary, transformative research. Chapter 3 provides an overview of the PAs included in the project, which are spread across several countries in the Mediterranean region. Section 4 describes the pathway that the participatory assessment followed in the project. This pathway describes the various objectives of the project, that were tackled chronologically in the course of the project. Linked to the objectives, are the respective methods that were chosen and adapted to accommodate the regionally differing contextual factors in the PAs. Finally, Section 5 provides a reflection and outlook on the work carried out during the REACT4MED project. Overall, this report offers a comprehensive overview of the participatory approach of the REACT4MED project and its methodology applied to achieve its objectives to enhance sustainable land and water management in the arid and semiarid agro-ecosystems of the Mediterranean region.

2 Conceptualisation of Ecosystem Restoration Living Labs (ERLLs)

This chapter discusses the concept of ERLLs in REACT4MED and how stakeholder participation is central to their approach. ERLLs are a form of Living Labs that take place in real-life conditions, involving local stakeholders who contribute local knowledge to advance both the development and implementation process of restoration actions. The chapter highlights the importance of including local and practical knowledge in the research process, making it transdisciplinary. After the theoretical basis, it outlines the participatory approach in REACT4MED including the aims of the ERLLS, which were elaborated by the scientific partners in an interactive workshop, the activities within the ERLLs during the project runtime and the collaboration between project partners with different roles. It ends with a reflection by project partners on the role of different stakeholders in the transdisciplinary process.

2.1 Definition and approach of ERLLs in REACT4MED

Figure 2: Attributes of research in Ecosystem Restoration Living Labs (adapted fromAlbiez et al. 2020)

In their review Hossain et al. (2019) find a difference between the framing of Living Labs (LLs) in North America and Europe. While in North America LLs are situated in artificial environments, European LLs take place in real life conditions. We connect to the European approach and argue that real life conditions allow researching innovation processes within specific contexts involving local stakeholders who can contribute local knowledge to advance both the development and implementation process. In the context of REACT4MED, stakeholders can commonly comprise land users (farmers, forest owners), educators (farm advisers, teachers), policy-makers (regulators, administrators), lobby groups and networks (farmers' associations, business, non-governmental organisations), researchers and

inhabitants of the area. However, the concrete composition of stakeholders, which may differ for each PA, depending on the regulatory, political, cultural and social context as well as the characterisation of the agricultural system and the focus of the problem situation to be dealt with in the respective PAs. In the German literature on experimental and transdisciplinary research approaches at the science-society interface, Real World Laboratories, (Sustainable) Living Labs, (Urban) Transition Labs and Transformation Labs, are distinguished from each other in relation to several key characteristics and how these are operationalised (Schäpke et al. 2018). The ERLLs can be situated as a mixed form between Real World Laboratories and Sustainable Living Labs, depending on the research questions to be answered and the PAs in which they are conducted. As this distinction is not applied in the international literature, we will use the term Living Labs when talking about the ERLLs in REACT4MED.

While the LLs are situated in a real-life environment, the research interactions are especially created and feature therefore **laboratory conditions** which include the means and the location required for the experiments (Albiez et al. 2020). In REACT4MED, the means include the knowledge provided by the researchers regarding the good practices that will be or are implemented in the PAs. The ERLLs will convene in workshops to answer questions with a **research perspective**. Research questions in LLs are answered by conducting experiments, with clearly defined boundaries (Schäpke et al. 2018). In RECT4MED, these research questions are posed by the researchers and jointly answered by the persons attending the ERLLs.

Including local and practical knowledge in the research process makes research in LLs per definition **transdisciplinary** (Schäpke et al. 2018; Parodi et al. 2016). Transdisciplinary research is defined as “integration of multiple disciplines and the active inclusion and participation of stakeholders representing different societal sectors in the processes of problem formulation, knowledge production, and learning” (Angelstam et al. 2013) where the focus lies on complex societal problems (Lang et al. 2012). Many aspects of transdisciplinarity are featured therefore in the conceptualisation of LLs. They follow the **normative goal to contribute to societal transformation towards sustainability** (Parodi et al. 2016). In REACT4MED, we focus on the transformation of agriculture in arid and semiarid agro-ecosystems towards sustainable land and water use, the reversion of land degradation and the improvement of livelihoods of Mediterranean communities.

With the focus on sustainable transformation, the aim of a LL is a practical contribution by creating actionable knowledge in contrast to theoretical and descriptive knowledge (Schäpke et al. 2018). Actionable knowledge is produced as all actors engaged in the LLs collaborate on the research problem at hand (Schäpke et al. 2018; Hossain et al. 2019). Real collaboration in which all actors participate on eye level is a necessary condition for **social learning** (Pahl-Wostl et al. 2007). **Trust and reflexivity** are important characteristics and conditions for a social learning process (Pahl-Wostl und Hare 2004), which the research environment within a LL needs to feature (Schäpke et al. 2018). These conditions within the ERLLs in REACT4MED shall be facilitated for the workshops through the guidance of the team of Osnabrück University and implemented by the scientific Pilot Area Leaders (PALs). The artificiality of the ERLLs provides a room for the planned experiments, which may facilitate the reflection of norms regarding societal processes and therefore create a non-hierarchical learning environment.

As research in LLs focusses on real world problems, their **outcomes are transferable to other areas (geographical or topical)** (Schäpke et al. 2018). In REACT4MED, the insights gained on restoration actions shall be transferred to other locations in the Mediterranean region that face

similar problems of soil degradation. Insights gained within the ERLLs on the research methods can support other LLs. LLs shall be organised as a **long-term process** (Schäpke et al. 2018; Parodi et al. 2016). While REACT4MED is a three-year research project, the work within many PAs builds on previous relations between stakeholders and researchers and enhances therewith a long-term character and ongoing exchange and collaboration between science and practice.

Finally, in order to amount to the challenge of disputed and complex sustainability challenges, three forms of knowledge are distinguished that together are expected to bridge the gap between scientific analysis and practical action (Hadorn Hirsch et al. 2008). **Systems knowledge** refers to the empirical knowledge relevant to analyse and understand the current state of a problem and its context. **Target knowledge** entails any knowledge about a desired target state, it is normative in nature. Connecting systems and target knowledge, **transformation knowledge** encompasses relevant knowledge on how to make the transition from the current state to the defined and desired target state.

2.2 Stakeholder participation within participatory research in REACT4MED

2.2.1 Definition of stakeholder engagement

Transformative research in living labs is determined amongst others by a high intensity of stakeholder participation. Stakeholder participation as defined by OECD (2015) concerns the process by which any person or group who has an interest or stake in a particular topic is involved in the related activities, decision-making and implementation processes. This includes people who are directly or indirectly affected by a decision or who can influence the outcome of a negotiation or implementation process. The increase on intensity of involvement is often portrayed as the rungs of a ladder (Arnstein 1969). The ladder of participation encompasses six levels of engagement depending on processes, intensity and intentions of stakeholder engagement. It progresses from communication as a mostly passive way to engage stakeholders with low influence on final decisions all the way to co-decision and co-production where stakeholders have a direct authority over decisions taken. Different degrees of stakeholder engagement are suitable at different stages of a project. Planning stakeholder engagement comes with the challenge to manage capacities to coordinate and implement the engagement process and expectations concerning the respective intensity and the desired outcomes generated.

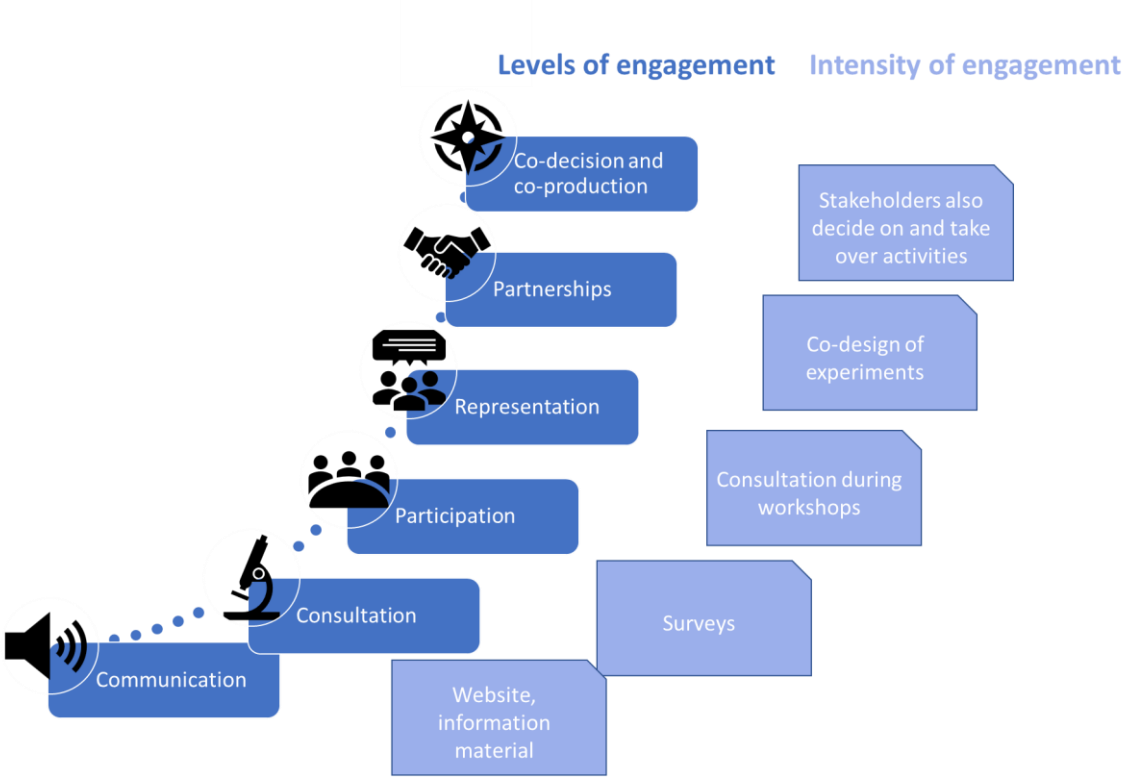

Figure 3: Different levels of stakeholder engagement in water-related topics (OECD 2015) and respective exemplary formats of engagement

2.2.2 Reflection: Experience with stakeholder engagement in the REACT4MED consortium

In order to gauge the experience of the project partners with stakeholder engagement in their research, an interactive exercise during the project kick-off meeting in Heraklion, Crete, in 2022 was conducted. On the one hand, the purpose was to collect information about the level of experience with stakeholder engagement in research projects. On the other hand, the goal was to familiarise project partners with the type of sessions which will be included in the ERLL activities.

In this exercise, participants were asked to allocate themselves on a position along a gradient from high to low in order to jointly answer questions on experiences with participatory methods and stakeholders in the PAs. The pictures in the following portray the allocation along a gradient that moves from low on the right side of the pictures to high on the left side. Participants were asked to explain why they positioned themselves at the spot they chose. These explanations are presented in the following.

Question to all partners: What is your experience with participatory methods?

Photo by E. Lukat

High	INRA: Innovation Platforms that are conceptualised as Living Labs CIHEAMi: Constant contact and feedback to stakeholders, network of different stakeholders
Medium	HMU: Participation not 100% successful SOFTW: Projects with participatory approaches that mainly focussed on collecting information for developing indicators. Process was too technical for some stakeholders. UH: Experience resembles SOFTW's explanation. SOFTW: Often stakeholders are interested, but they do not always implement outcomes.
Low	TUC: Involved in process with participatory approaches, but others were in contact with stakeholders.

Question to PALs: How intense is the contact to your stakeholders?

High (continuous exchange, integrate their inputs into your work)	**Morocco**: Involvement already stands for 16 years. **Cyprus**: Involved intensively. Stakeholders were interested in participating in a project as they felt left out previously. **Israel**: Policy makers are in touch and seek guidance. Communication more informal via WhatsApp **Italy**: Frequent contact, filed visit with students at least once per year, collaboration with local administration, involvement during entire project lifetime. **Crete**: Frequency differs between stakeholders, but contact is close. Long established relationship, (co-design). **Turkey**: good relationship with SH, also from previous projects. SH/farmers are eager to learn and to share their resources/knowledge.
Low (one time or few contacts e.g. during field visits or workshops)	-

Question to PALs: How accessible are digital media to the stakeholders?

High (interact and engage with digital methods)	**Italy**: Administration: high. **Israel**: In this project: high. In general: ready to be involved digitally. **Morocco**: Champion farmers high, all have websites. **Turkey**: Almost all use smartphone apps and information. Access is given. Farmers are generally less educated than stakeholders in the urban setting.
Medium (communicating back)	
Low (not accessible at all, only receiving information)	**Italy**: In a former project, an app was developed but farmers could not use it. Some farmers can fill in online surveys. **Crete**: Information that can be found in the internet is not tailored to Mediterranean climate. Most people don't use the Internet. They could, but don't have the motivation. Answering a survey would need guidance (due to lacking understanding/background). **Cyprus**: Ageing farming generation. No use of mobiles. During lockdown, elder people learned to use mobile phones.

2.3 Participatory approach in REACT4MED

In order to achieve its goal to enhance sustainable land and water management and reverse land degradation, the project has identified eight PAs in Turkey, Morocco, Israel, Egypt, Cyprus, Greece, Spain, and Italy as platforms for the ERLLs.

At the beginning of the REACT4MED project, among the ERLLs, stakeholder engagement has been at different stages, depending on previous participatory research of the PALs. As a result, the overall guidance had to be adaptable and sensitive to the local context of each PAs from the beginning.

Working in close collaboration with PALs and other work packages, WP 3 developed a structure and guidance for participatory processes. These processes were related to different project activities and were focussed on different phases of engagement and themes. To engage stakeholders meaningfully, various workshop formats were used, including face-to-face and online formats, which were adapted in discussion with the PALs to suit the local conditions of each PA. Also, depending on the objective of the respective activity, different stakeholders were selected. The resulting structured meetings, which were carried out in each PA, were complemented by informal meetings between PALs and stakeholders based on the local situation and demands. While WP 3 provided the stakeholder engagement structure and guidelines, PALs always served as direct contact to their stakeholders.

This chapter will explore the participatory approach used in the REACT4MED project in more detail, highlighting the different aims, activities and the approaches of the participatory processes in the eight PAs.

2.3.1 Aims of the ERLLs

In order to create a common understanding of transdisciplinary and participatory research within the project team, an interactive discussion on the aims of the ERLLs took place during the project kick-off meeting in Heraklion, Crete, in 2022. Simultaneously, the session aimed at creating experience on the side of project partners with interactive methods.

The discussion focussed on the questions “What are the aims of the ERLLs?” and “What do you expect from and wish for the ERLLs?”. The discussion of aims and expectations was organised first as an individual brainstorming, in the second instance as a dialogue between two participants, thirdly as a joint discussion between two dialogue groups each and at last as the sharing of ideas with the whole group (Figure 4). The outcomes of the plenary session were later on clustered and are presented below (Figure 5).

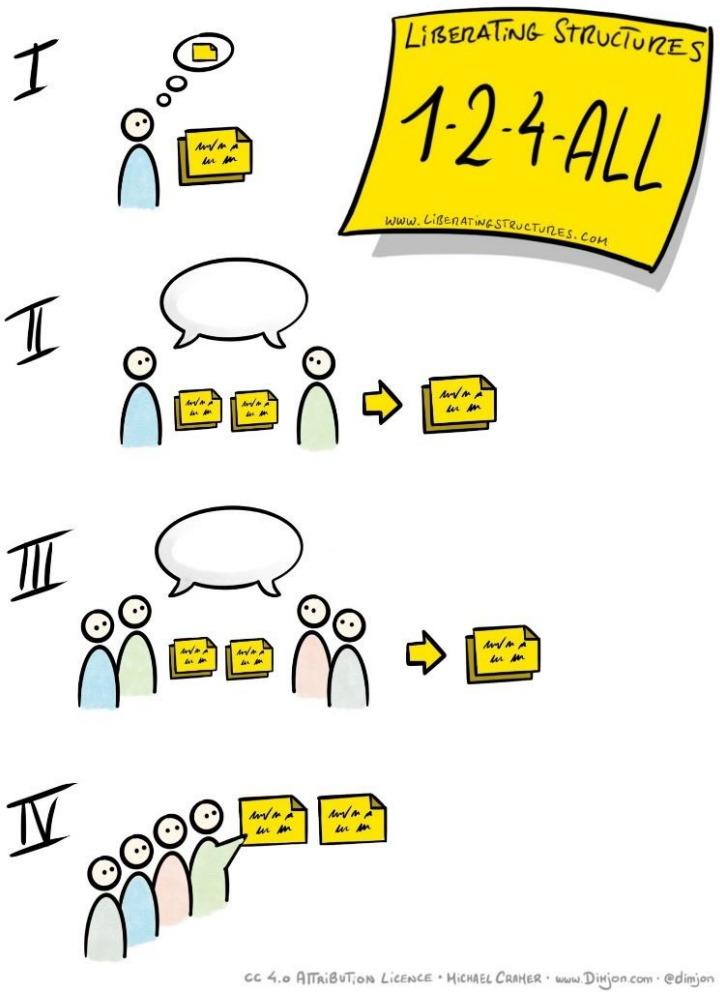

Figure 4: Schematic description of the facilitation method 1-2-4-All (illustration Michael Cramer under CC-BY-4.0).

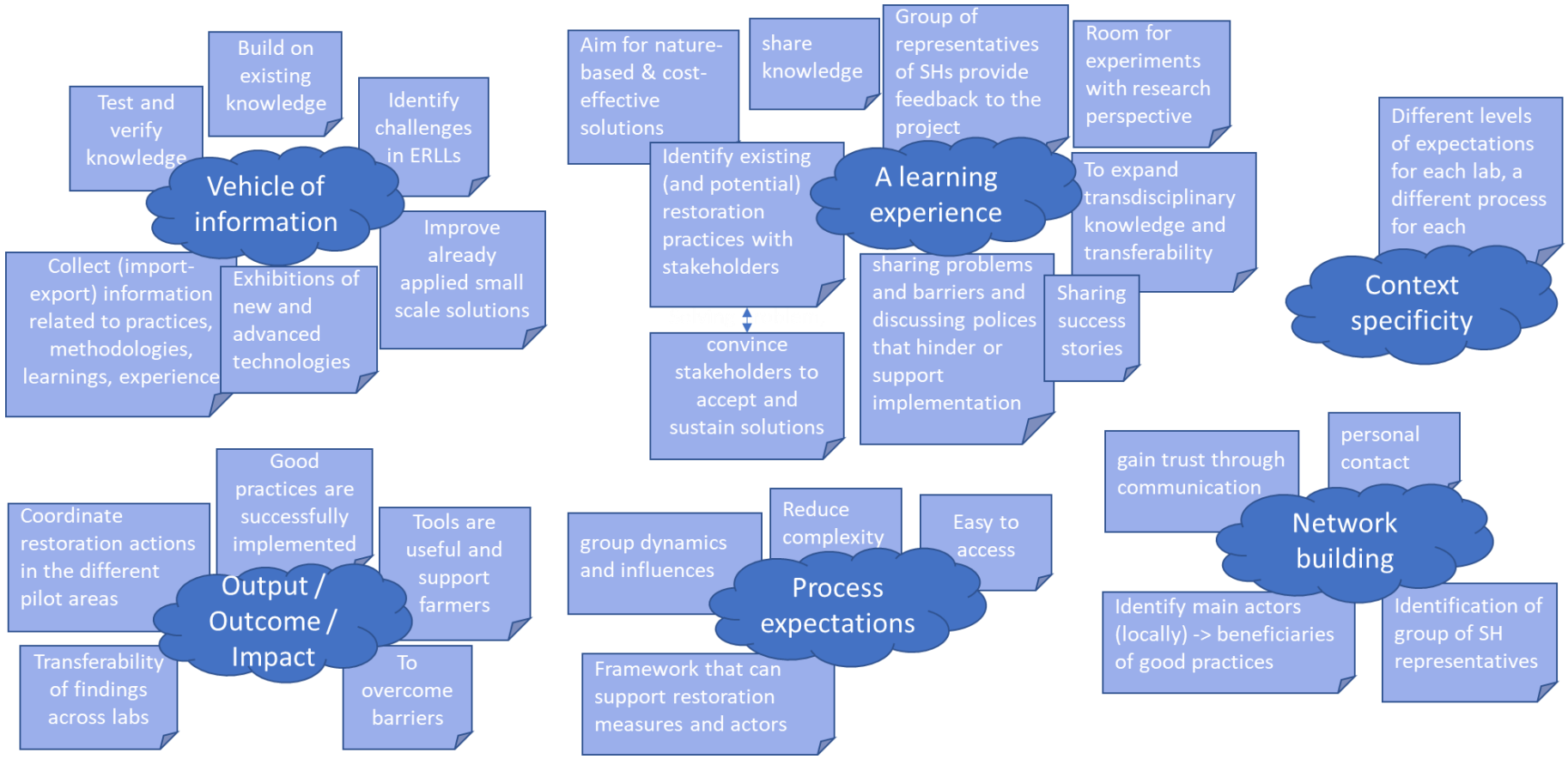

Figure 5: Clusters of aims and expectations of REACT4MED partners

2.3.2 Activities within the ERLLs in the frame of REACT4MED

The participatory process to continuously engage stakeholders in the various topics addressed in REACT4MED is based on two different ways to engage (Figure 6). Restoration actions are identified agricultural activities implemented by stakeholders in each PA to test their remediation potential for agricultural soils in the PA. These restoration actions are coordinated by the PALs. At the same time, throughout the project, thematic workshops are organised at regular intervals in each ERLL. Thus, each thematic workshop is in fact a series of eight workshops with similar objectives implemented in each PA. All workshop series are prepared by WP 3 in close collaboration with both thematic WPs and PALs. Once finalised, they are organised and implemented by the PALs in the local language of each PA. In the following, an overview on both restoration actions and the thematic workshops is given.

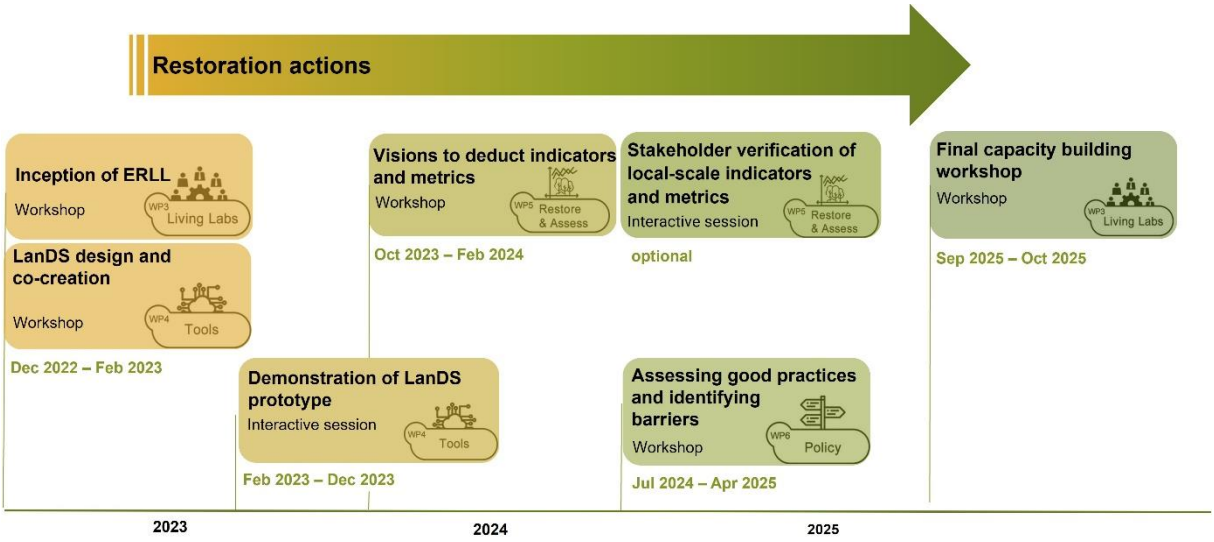

Figure 6: Overview of thematic focuses of activities throughout the project

Restoration actions

Initially, appropriate restoration actions suitable for the conditions and challenges of each PA were pre-identified by the PALs. The selected restoration actions were diverse, targeting various forms of land degradation such as soil erosion by water, soil salinisation, and loss of biodiversity. Techniques to combat these issues include conservation agriculture, terracing, mulching and cover crops, forestation, and irrigation technology. Throughout the development of the ERLLs, the restoration actions were further discussed, evaluated and adapted with the stakeholders. The goal was to find stakeholders that implemented or were willing to implement the restoration actions and support them in their effort with scientific evidence and consultation. At the same time, restoration actions were used to collect data for the assessment of their implementation potential on a broader scale.

1. Workshop: Inception of ERLL

Aims

Establishing the Ecosystem Restoration Living Labs (ERLLs) to act as a platform for interaction of stakeholders with project partners

- Introducing the project to the stakeholders
- Specifying the context and aligning stakeholders on the problem definition in the PA
- Introducing the different stakeholders to each other (if necessary)
- Outlining project goals and activities to stakeholders
- Assessing and extending the knowledge of relevant stakeholders in the PA

Activities

- Introduction of the workshop and the REACT4MED project (presentation, questions and answers)
- Round of introduction between all participants (interactive session)
- Problem definition for sustainable soil management in the PA (interactive session, see chapter 4.2)
- Project activities in Ecosystem Restoration Living Lab: How can the work in the PA look like? (interactive session, see chapter 4.2.2)
- Stakeholder identification: snowballing (questionnaire)
- Evaluation (questionnaire)
- Guided tour through the PA (optional)

Stakeholders

Since this is an introductory event, we recommend that stakeholders from various backgrounds can meet each other and work together on defining the problem they want to address with PALs. This will help stakeholders to get an understanding for the needs and interests of different stakeholders and to create a common problem understanding. This is necessary to build a solid base for a continuous collaboration.
For future workshops, at different stages it might be more appropriate to selectively hold workshops targeting certain stakeholder groups.

- Thus, a wide spectrum of stakeholders and representatives from the different identified stakeholder groups should be present, with whom you want to collaborate throughout the project runtime
- To give a voice to underrepresented stakeholders, a higher share of about 30 % is crucial to the success of their involvement. Therefore, we encourage to especially reach out to young and female stakeholders that hold positions that are well respected in the community to be present at the workshop (e. g. head of a cooperative, influential administrator, established farm adviser, well connected member of an NGO)
- We recommend a share of about 50 % farmers and farm advisers/extension officers. The other half of participants should represent stakeholders from relevant SH groups and topics.

Project Management:	
Project relevance	Task 3.2
Partners involved	OU (lead), all PALs
Relevant for	MS3.1 (M12): Internal ERLL workshop report
Timing	M7-M10 (Dec 22 - Feb 23)
First implemented in	Bethlehem of Galilee (IL)

2. Workshop: LanDS design and co-creation

Aims	Co-design: Requirements of and feedback on LanDS • presenting concept and approach of the tools to assess and evaluate opportunities for up- and outscaling, getting data and feedback from stakeholders
Activities	Part of the inception workshops • Presentation of the LanDS – Land degradation Decision-Support Toolbox (presentation on concept, questions for co-design, application example, questions and answers) • Identification of issues (in addition to those identified in the inception workshop) and solutions (interactive session, see chapter 4.2.3) • Shaping functionalities (interactive session, see chapter 4.2.3)
Stakeholders	• Representatives of policy-makers and -advisors, farmers representatives, non-governmental and civil society organisations and the scientific community should be present
Project Management:	
Project relevance	Task 3.2, Task 4.1
Partners involved	SOFTW (lead), UO, all PALs
Relevant for	○ MS3.1 (M12): Internal ERLL workshop report ○ MS4.1 (M10): Stakeholder feedback collected ○ D4.1 (M10, SOFTW): Report summarising the outcomes of ERLL stakeholders' involvement process and defining features and requirements of the LanDS toolbox ○ D4.2 (M20, SOFTW): LanDS toolbox prototype
Timing	M7-M10 (Dec 22 - Feb 23)
First implemented in	Bethlehem of Galilee (IL)

3. Interactive (online) sessions: Demonstration of LanDS prototype

Aims	• Demonstration of LanDS prototype: concept, tools and functionalities
Description of LanDS toolbox	In general, SOFTW extrapolated the most relevant information from the WS held in the different PAs to shape the LanDS toolbox to make it user-friendly and interesting tool for the stakeholders' groups involved. Exchange with PALs supported the framing of LanDS functionalities, while data produced and collected in WP2 were fundamental for populating the toolbox and for developing the Indicators Code Library and Machine-Learning based procedure (for further information, please see Deliverable D4.3 *Final LanDS Toolbox*). The main interest emerged from SHs interactions during the ERLLs related to the identification of areas with high land degradation, knowledge and data sharing on the effects of the restoration actions (e.g., see Table 2 in Section 4.3.2), which have been considered and included in the LanDS development.
Stakeholders	• Interested stakeholders from the first ERLL workshop or involved in the co-design process • Technical oriented stakeholders • Participating stakeholder groups: administration and policy, farming (farmers, land owners, farm advisors, cooperatives), research & academia

Project Management:	
Project relevance	Task 3.2, Task 4.1
Partners involved	SOFTW (lead), UO, all PALs
Processing information of	○ D4.2 LanDS toolbox prototype (SOFTW, M20):
Relevant for	○ MS3.3 (M18): Data gathered and provided to WP4 for the development of LanDS ○ D4.3 (M32, SOFTW): Final LanDS toolbox
Timing	M10 – 19 (Feb 23 – Dec 23)

Restore and Assess

4. Workshop: Visions to deduct indicators and metrics

Aims	• Definition of normative dimensions for assessment criteria for restoration actions (benefits and costs) • Develop knowledge for identification of barriers and capacity development • To develop a context specific framework for sustainability assessment regarding the restoration actions by involving stakeholders in the task as well as using local knowledge.
Activities	• Reflecting on the group's background to understand the group's influence on the vision • Individual visioning to prepare the group visioning exercise • Group visioning exercise • Plenary discussion of visions and reflection on disagreements on vision elements
Stakeholders	• Farmers, farm advisors, and stakeholders from the last workshop, representatives of society (citizens, associations dealing with food)

Project Management:	
Project relevance	Task 3.3
Partners involved	UO (lead), CIHEAM, all PALs
Processing information of	○ D2.1 (M10, UVEG) The state of the art and state of practice of Mediterranean agro-ecosystem restoration ○ D2.3 (M16, UH) Meta-analysis of restoration actions in the Mediterranean
Relevant for	○ D3.2 (M24, CIHEAM): Co-developed indicators and metrics ○ Task 5.2 (M6-30, CIHEAM): Biophysical assessment of implemented restoration actions ○ Task 5.3 (M18-34, CYI): Economic and social analysis of the impacts of restoration practices
Timing	M18 – M22 (Oct 23 – Feb 24)
First implemented in	Stornara and Tarra (IT)

5. Interactive (online) sessions: Stakeholder verification of indicators and metrics

Aims	• Verification of local-scale indicators and metrics
Activities	• Focus group discussions of selected indicators on farm and regional/societal levels
Stakeholders	• Farm level: Extension workers, farmers associations, NGOs, research and education

- Regional and societal level: administration, policy makers, NGOs, research and education

Project Management:	
Project relevance	Task 3.3
Partners involved	UO (lead), CIHEAM, all PALs
Processing information of	○ Workshop 4
Relevant for	○ D3.2 (M24, CIHEAM): Co-developed indicators and metrics ○ Task 5.2 (M6-30, CIHEAM): Biophysical assessment of implemented restoration actions ○ Task 5.3 (M18-34, CYI): Economic and social analysis of the impacts of restoration practices
Timing	optional

Assessing good practices and identifying barriers

6. Workshop: Assessing good practices and identifying barriers

Aims

- Assessment of barriers to and opportunities for the implementation or uptake of good practices, including capacities, governance, socio-economic conditions, investment opportunities, economic instruments that facilitate public and private investments and cultural aspects
- Identification of factors needed for upscaling and outscaling of best practices
- Capacity building of researchers, practitioners and policy makers on context factors for successful implementation as well as up- and outscaling of best practices

Activities

- Reflection and agreement on a common vision
- Backcasting exercise to identify major changes, barriers and opportunities as well as actions and actors to up- and outscaling of restoration actions by both practitioners and decision-makers
- Discussion of and feedback on identified changes, steps and actors by the entire group

Stakeholders As the workshop aims to process knowledge on upscaling and outscaling the restoration activities, different groups of stakeholders are invited:

- Group Upscaling with a focus on the restoration action: farmers, farm advisers, supply chain organisations (suppliers, retailers, cooperatives etc.), scientists
- Group Outscaling with a focus on the landscape level and policies: policy makers, education, NGOs and consumer groups, scientists

Project Management:	
Project relevance	Task 3.4, Task 6.4
Partners involved	UO (lead), CYI, all PALs
Processing information of	○ D6.1 (M8, INRA, CIHEAM, CYI): Policy Review: Up-scaling (Co)-Benefits, opportunities, and alternatives
Relevant for	○ D3.3 (M34, UO) Assessment of good practices and policies for land restoration ○ Task 6.4 (M30-36, CYI): Policy recommendations for enhancing investments in SLWM
Timing	M27 - 36 (Jul 24 – Apr 25)
First implemented in	Cànyoles river basin (ES)

7. Workshop: Final Capacity Building Workshop

Aims	• Capacity building of researchers and practitioners: implementation of best practices in the local circumstances
Project Management:	
Project relevance	Task 3.4, Task 6.4
Partners involved	UO (lead), all PALs
Processing information of	○ D3.4 (M34, UO): Input for capacity building guidebooks ○ MS7.1 (M34) Guidebooks translated and published ○ Task 2.4 (M3-18, TUC): Historical evolution and future storylines of climate and human activities in relation to ecosystem changes in the Mediterranean ○ Task 4.3 (M24-34, SOFTW): LanDS dashboard ○ Task 5.2 (M6-30, CIHEAM): Biophysical assessment of implemented restoration actions ○ Task 5.3 (M18-34, CYI): Economic and social analysis of the impacts of restoration practices
Timing	Approx. M41 (Sep 25)
First implemented in	Lower Gediz (TR)

2.3.3 Approach to integrate work packages into the ERLLs

The preparation of the different thematic workshop series needs to accommodate both the demands of the WPs that are involved in the respective workshops as well as the local requirements of each PA. Consequently, the coordination of the different activities follows a stepwise workflow (Figure 7). To start the preparation of the in-person workshops, WP 3 contacts relevant WPs and PALs consecutively and moderates the preparation process of each workshop series. With each step, the frame and objective of the workshop series, its outline and operationalisation are more substantiated while feedback is iteratively considered. Towards the end of the process, WP 3 provides a thorough online trial workshop for all PA teams that were meant to carry out the workshop. The preparation of a workshop series is oriented on five steps.

1. Define the objective, scope and preliminary target group of the workshop series
2. Refine the objective and define outcomes and organisational requirements
3. Develop and refine appropriate methods based on the defined demands
4. Implement online trial workshop with relevant project partners
5. Fine-tune the workshop series concept and structure to the local context and give advice concerning the local implementations in all PAs

The workshop materials are then prepared as templates by WP 3 and subsequently adapted and translated by the PALs to the context and requirements of their PA. The workshop implementation happens in each PA. One PA is selected as the first to implement the workshop and serves as a test for the entire workshop series. Feedback is gathered from the first workshop and materials are adjusted if needed. The PA teams time the workshops as appropriate according to the local circumstances.

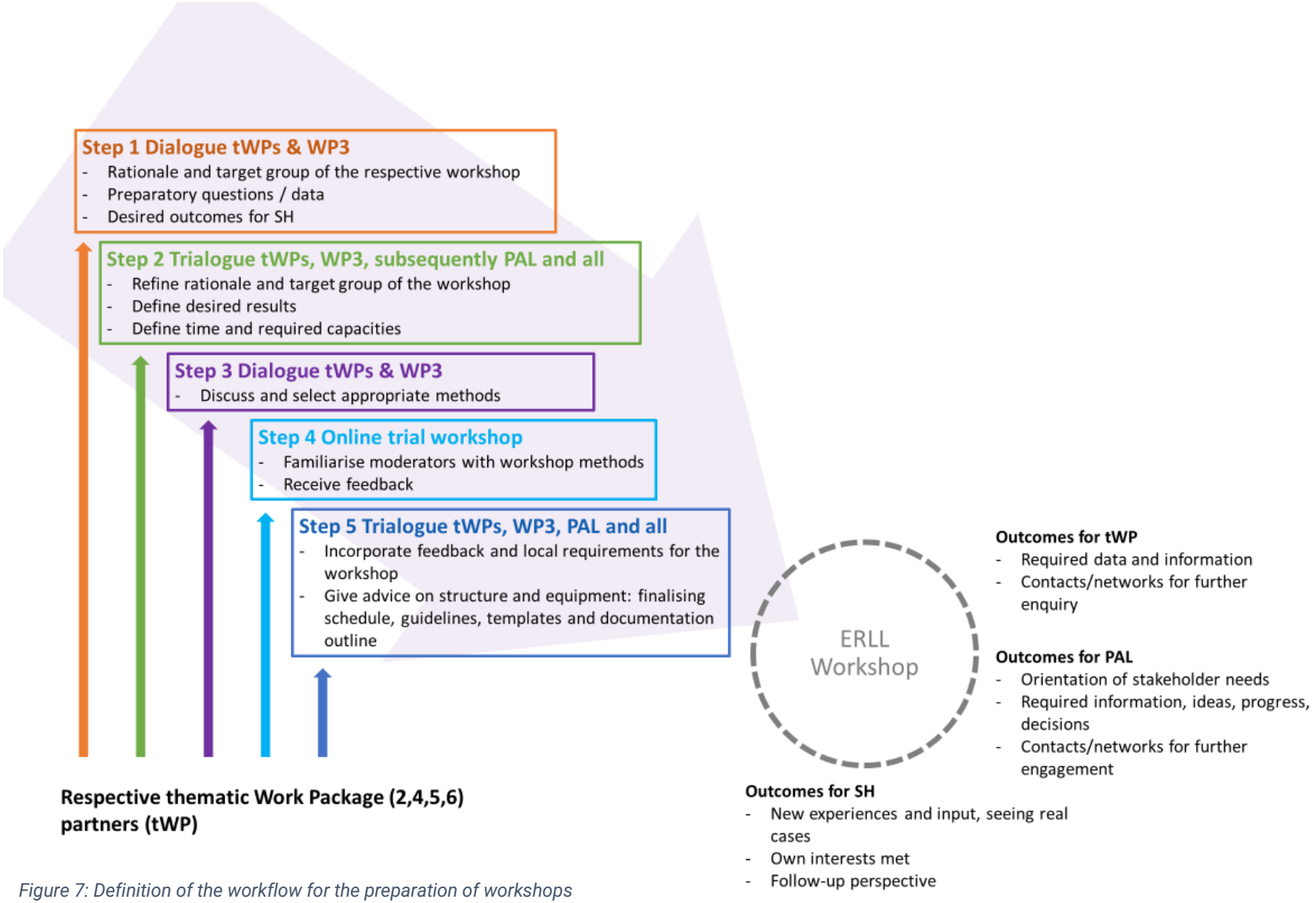

Figure 7: Definition of the workflow for the preparation of workshops

2.4 Roles in participatory research

2.4.1 Theoretical background

Participatory research that will take place in the ERLLs assigns a variety of roles to the participants of different stakeholder groups. In their systematic literature review of eleven papers on **transdisciplinary and transformative research projects** on sustainability problems, Hilger et al. (2021) investigated the **interaction processes and activities** between different actors in such research projects. Doing so, they deduced roles that participants take on either explicitly or implicitly in order to fulfil the projects' objectives. They summarised **15 roles** that cover the different activities and interactions in **four activity clusters**.

Unsurprisingly, the cluster of the **"field"** comprises practical expertise and application activities mainly provided by practitioners. In the realm of "**academia"** various research activities are commonly performed by researchers. "**Boundary management"** refers to the social-organisational and communicative activities that concern the establishment and facilitation of processes of knowledge co-production and include communication, mediation and translation of different knowledge systems. Boundary management is more often provided by researchers than other actors. Finally, activities of "**knowledge co-production"** focus on the integration of different knowledge systems and worldviews in order to co-produce new knowledge as an answer to complex problems. This includes, the elaboration of problem perceptions, goals, joint research questions, the reflection upon power dynamics as well as the engagement in experiments and generation of application-oriented knowledge. These activities are commonly contributed by actors from different backgrounds engaging in the projects.

For researchers, transdisciplinary research projects thus present a "research borderland" (Hilger et al. 2021), where the boundaries between the classical roles of scientific and non-scientific actors become blurred. Competing obligations such as the demand for scientific rigour on the one hand and the claim for societal relevance on the other hand, can become a serious challenge for the researcher. During transdisciplinary projects, researchers tend to adopt various roles to "fill the gaps" if activities need to be performed but nobody was assigned to them or chose the particular roles.

To navigate these competing demands, thorough reflection and transparency about the expectations and different roles can support all actors to perform their roles purposefully and effectively. An understanding of the different roles can help with a vocabulary that supports such a transparency between participants. When transparency is ensured at an early stage, it can decrease the pressure created by implicit expectations and competing demands on participants.

Especially activities concerning the boundary management are of a delicate nature. These are not typically associated with the scientific profession. In order to fulfil them properly, it is important to diligently plan the process design, select suitable methods and pay continuous attention to them.

Likewise, non-scientific actors often face the expectation of adopting the roles that are assigned to them externally. For them as well, collaboratively and explicitly addressed roles

can help balance power differences (between researchers and non-scientific actors) and provide clarity on what to expect in the collaboration and what might be expected of them.

Overall, being aware of different roles can support the expectation management and collaboration planning in a transdisciplinary research project. The diversity of roles highlights the importance of a comprehensive approach to coordination, communication, and process design. The framework of Hilger et al. (2021) provides an orientation for considering whether all necessary activities at different project stages are purposefully covered by certain actors and allows to check who needs to be integrated into the transdisciplinary research process, at which stage, and how.

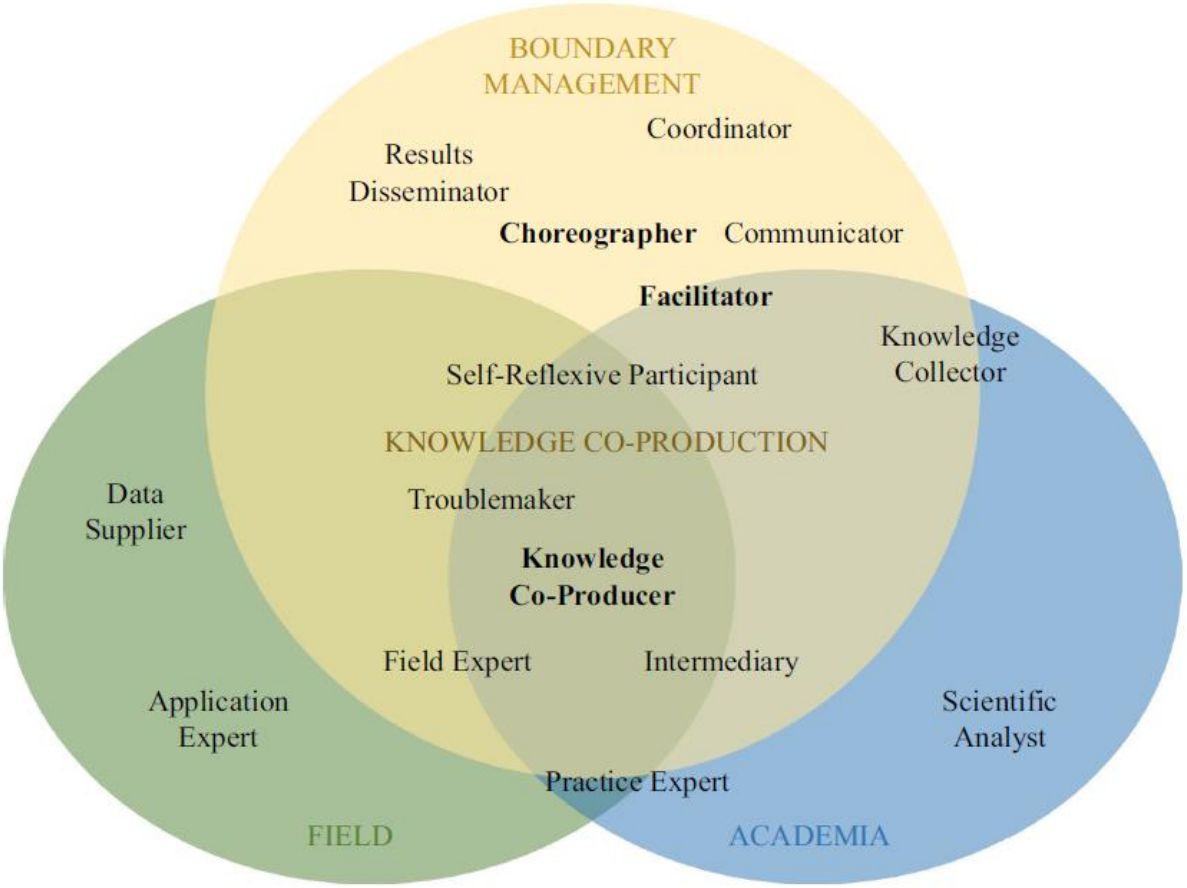

Figure 8: Actor roles as identified by Hilger et al. (2021) in transdisciplinary and transformative research projects. For a detailed description of roles see the Annex.

2.4.2 Perception of roles within the project team

During the kick-off meeting of the project, partners were asked to indicate their perceptions about which roles they would assign to which partner (and more generally to which stakeholders). In this discussion of the results of the exercise, we distinguish between external and internal expectations. Where external expectations (of other partners) do not meet internal

expectations (of the partner in question), tasks associated to roles might not be fulfilled which can lead to conflicts or in the extreme case to failure of delivering the required outcomes. This is particularly the case, when those organising the process expect certain partners to fulfil a certain role, whereas these respective partners do not understand the role and the associated tasks as belonging to them (3). When planning the interventions in ERLLs we will make use of the role scheme to reflect upon the different expectations.

External expectations were interpreted as high, when 6 or more votes from 14 participants (UO's votes were counted as one vote) were in favour of assigning a role to a certain task. Internal expectations for PALs were valued as high, when 4 or more of the 6 participating PALs assigned themselves to a role. Likewise, internal expectations for thematic WP partners were perceived as high when 4 of the 7 participating thematic WP partners or more assigned themselves to a role.

	Internally expected (≥4 institutes assigned themselves to the role)	Not internally expected (<4 institutes assigned themselves)
Externally expected (≥6 votes in favour)	(1) Role will be fulfilled. Expectations will be met.	(3) Role will not be fulfilled. Expectation will not be met, which might lead to conflicts due to uncovered tasks.
Not externally expected (<6 votes in favour)	(2) Role will be fulfilled Roles might overlap, which might lead to conflicts due to an overlap of responsibilities	(4) Role will not be fulfilled.

Figure 9: Scheme of evaluating internal and external expectations regarding role allocation.

Roles with divergent interpretations

Throughout the exercise, it became apparent that expectations of certain roles were less aligned than about other roles. In the following we briefly present some of the roles where there were more divergent views. Unsurprisingly, these roles mainly originate from the field of boundary management and knowledge co-production, fields where the boundaries of professions are blurred and where "activities are not per se scientific activities" (Hilger et al. 2021, S. 2063). Throughout the presentation of the results below, the roles will be related to project-related tasks to become more specific.

- **Self-Reflexive Participant**

In transdisciplinary and transformative research, all participants, farmers, scientists, policy-makers as well as facilitators should be aware of their own underlying assumptions, worldviews and the kinds of normative values and knowledge they bring in. Researchers should also reflect on the internal and external power dynamics in the project. The idea is to create an open atmosphere in which collaboration can happen on eye level with participants and where new solutions might be generated.

- **Choreographer**

The choreographer supports the co-production of knowledge and sets the stage for interaction processes and the joint development thereof. This requires responsive process management such as responding to arising needs of participants and writing observation protocols about the interactions.

- **Intermediary**

The intermediary translates different knowledge systems and makes them visible for knowledge integration. This is a task that mediates between different backgrounds (for example local context-specific knowledge, scientific knowledge or regulatory and legislative knowledge). A sensitivity for different knowledge systems should be promoted and integration by boundary spanners (e. g. consultants, advisers) should be supported.

- **Coordinator**

Coordination tasks include the planning, adaptation of workshop preparations to the local conditions, the organisation of infrastructural matters and their implementation as well as the contact to the SHs and the communication with them. These are important tasks that determine the success of any transdisciplinary project.

- **Troublemaker**

The idea of the troublemaker deals with the conflicting or negative aspects that can arise in transdisciplinary projects. It can refer to dysfunctional social group dynamics, conflicts based on different interests, unfulfilled expectations or interpersonal discrepancies. If not addressed, these can hinder the supply, application, or collection of data from the field.

- **Results disseminator**

The results disseminator translates and disseminates results and raises awareness on the topic of the transdisciplinary project. This includes the communication of policy-relevant knowledge, recommendations, or tools as well as the writing of popular science articles or reports.

- **Facilitator**

The facilitator moderates meetings or workshops, builds trust and confidence about the project and between actors, encourages expressions of all viewpoints and provides deliberate space for critical reflection. In general, the facilitator's responsibility is to encourage knowledge integration where various kinds of knowledge meet.

- **Communicator**

The communicator broadly engages in informal as well as formal communication on project matters.

- **Knowledge Collector**

The knowledge collector is concerned with the collection of data (e.g. interviews, observations, surveys). This includes the documentation and presentation of knowledge.

Project coordinator

While the expectations of roles to be fulfilled by the project coordinator seem appropriate for the entire project, there is a mismatch in the roles of the Choreographer, the Facilitator and the Intermediary within the Living Labs. There was probably a misconception based on the phrasing of the tasks, as these often mention "project", which in the context of the article refers

to the Living Labs. In the ERLLs, these roles should be carried out by other project partners, mainly the PALs and WP3, as well as the thematic WPs.

In WP3's perception, the project coordinator needs to pay attention to the tasks outlined for the roles of coordinator, results disseminator, communicator and self-reflective participant. In particular the latter was rarely mentioned by the participants. However, working in transdisciplinary or even transformative research requires all participants, whether managing, scientific, facilitating or practical participants, to reflect upon the norms and values that they bring into the process as this determines the level of openness to other perceptions.

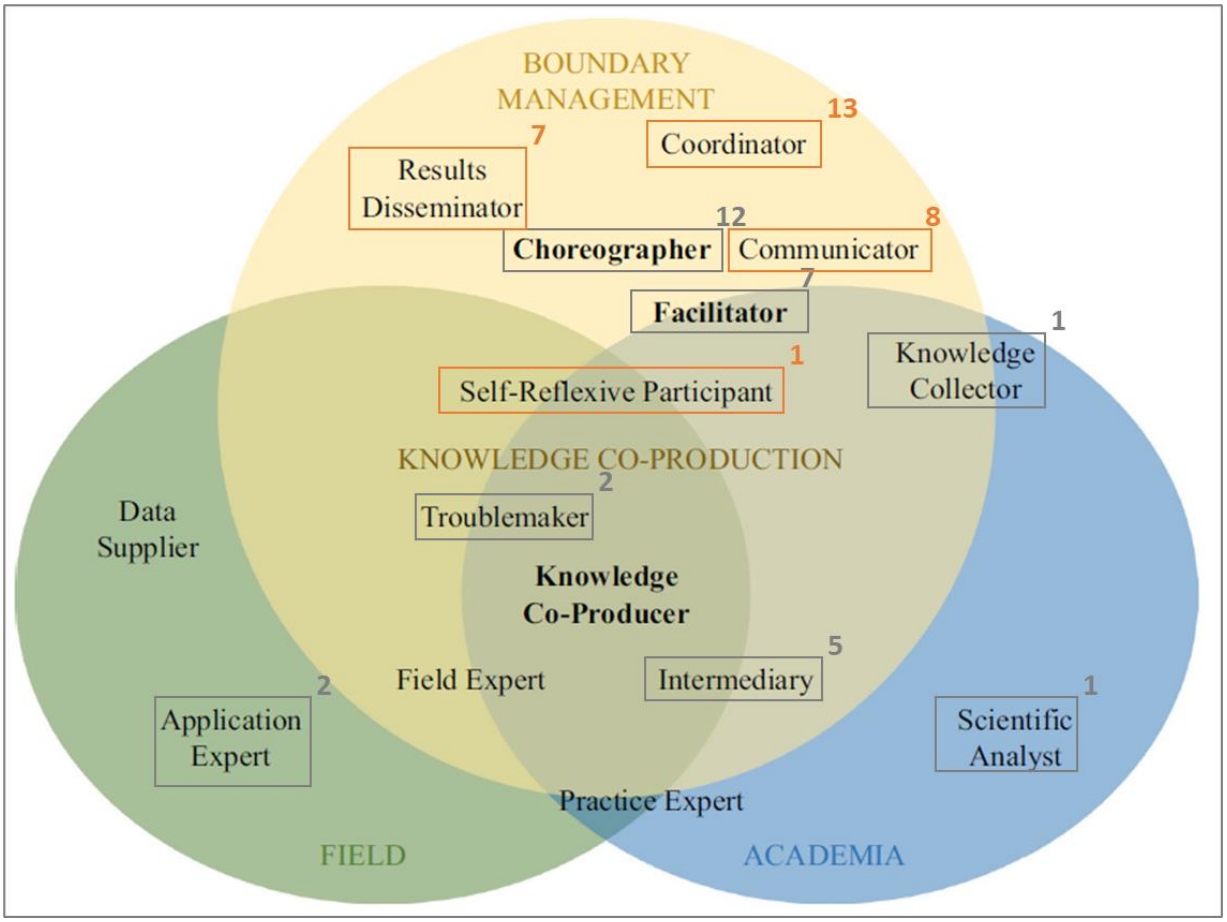

Figure 10: Presentation of the roles that the project coordinator of REACT4MED is (1) meant to take on in the view by the participants of the workshop (partners working in thematic work packages and PAs), each mention by partners is indicated with the superscript number. (2) The orange colour indicates the view of OU / WP 3. Self-perception is not presented here as the project coordinator did not take part in the task.

	Internally expected	Internally not expected
Externally expected	Intermediary Choreographer Facilitator Communicator Self-Reflexive participant	Knowledge collector Results disseminator
Externally not expected	Scientific Analyst Troublemaker Coordinator	

Externally expected but not internally, not applicable:

- **Knowledge collector**

OU can only offer support for the collection of knowledge. While we help with preparing the workshops and outlining the structure, the workshops and the collection of data and knowledge need to be implemented by locals in the original language (this is a reference to PALs who implement the workshop and the thematic WPs who define the requirements for the kind of information they want to collect).

- **Results disseminator**

OU can help preparing the workshops where it is possible to integrate communication. Also, based on the findings within the livings labs, UO will offer input to capacity building guidebooks for practitioners, policy makers, researchers (Deliverable 3.4). However, the main share of communicating results is probably done outside / following the ERLLs (this is a reference to both thematic WPs and Communication WP).

Not externally expected but internally:

- **Scientific Analyst**

OU will engage in scientific analyses of the processes taking place in Living Labs, as well as of the development of indicators and the analysis of barriers regarding socio-political aspects.

- **Troublemaker**

OU understands their role as to challenging known ways of doing research. Hence, rules of interaction and underlying assumptions will be regularly made explicit and challenged.

- **Coordinator**

OU is in charge of managing the transdisciplinary research process that is taking place in planned interactions within the ERLLs. As such OU, is contact person for the project coordinator regarding the ERLLs.

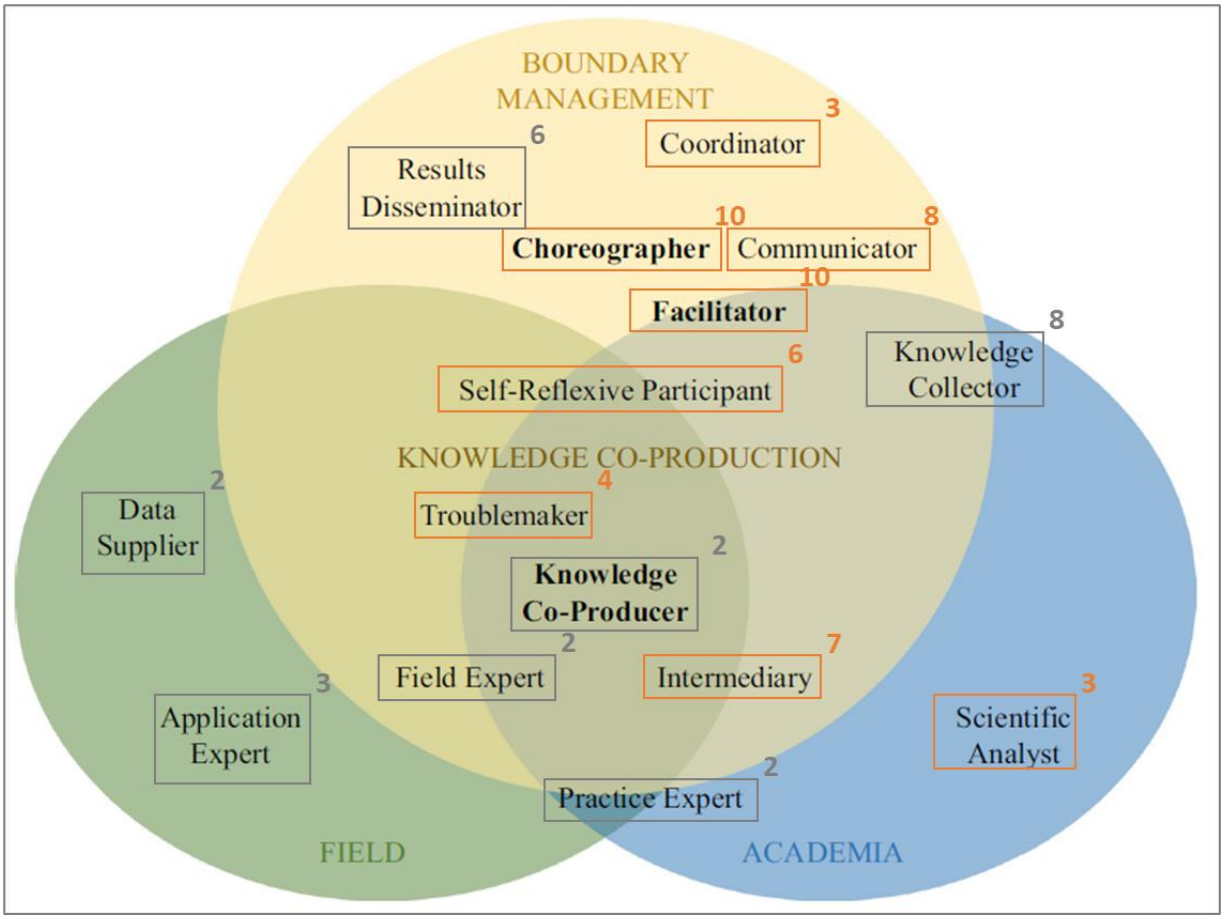

Figure 11: Presentation of the roles that OU / WP 3 is (1) meant to take on in the view by the participants of the workshop (partners working in thematic work packages and PAs), each mention by partners is indicated with the superscript number. The orange colour indicates which roles OU is willing to fulfil regarding the ERLLs.

Thematic WP partners (thematic WPs)

	Internally expected	Internally not expected
Externally expected	Scientific Analyst Data Supplier Results disseminator	Knowledge collector Knowledge Co-Producer Facilitator Communicator (Coordinator)
Externally not expected	Application expert	Troublemaker Self-reflective participant

Internally not expected:

- **Communicator**

The thematic WPs should be willing to - as far as they can - involve themselves in communication with other participants of the Living Labs. This means also, trying to understand the perspectives of different stakeholders and breaking down information for various target groups. As we want to create a dialogue instead of a hierarchical data extraction process, communication between all participants of the ERLLs will enhance the learning experience.

- **Knowledge collector**

Knowledge is collected by thematic WPs (and by PALs) it means the collection of information and data for different purposes. WP 3 supports with methods to facilitate the context in which data is collected during the workshops.

- **Knowledge Co-Producer**

OU understands that this is a key task of the thematic WPs. In collaboration with WP3, the thematic WPs will define the transdisciplinary research process and the required kinds of information. They will also process the information produced.

- **Facilitator**

The ERLLs are a room in which thematic WPs aim to answer certain research questions or fulfil tasks in collaboration with stakeholders and PALs. As they are the owner of the research problem to be answered, they need to engage in the facilitation of the workshop, in order to receive the answers they require.

- **Coordinator**

The role of the coordinator reached a high count by the participants. However, OU / WP3 does not understand the thematic WPs to carry out these tasks. These are mainly carried out by WP3.

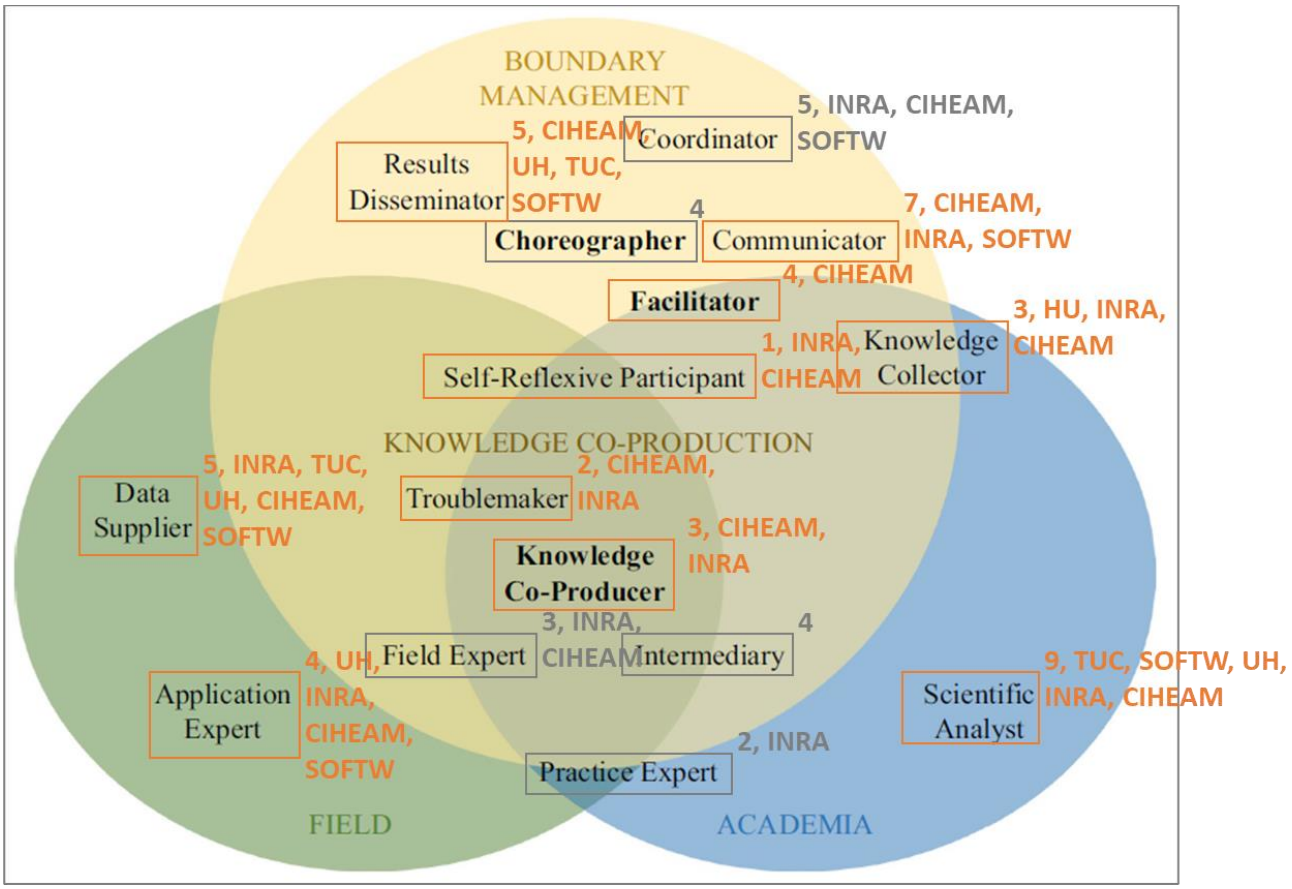

Figure 12: Presentation of the roles that the partners involved in thematic WPs (UH, SOFTW, INRA, CIHEAM, TUC, UVEG) are (1) meant to take on in the view by the participants of the workshop (partners working in thematic WPs and PAs), each mention is indicated with the superscript number. (2) The orange colour indicates the view of OU / WP 3. The roles that each partner institution belonging to a thematic work package wants to fulfil is expressed with the partner acronyms next to the number count.

Scientific Pilot Area Leaders (PALs)

	Internally expected	Internally not expected
Externally expected	Scientific Analyst Application Expert Data Supplier Knowledge Co-Producer Field Expert Practice Expert Troublemaker Results Disseminator Facilitator Knowledge Collector	Intermediary Coordinator
Externally not expected	Communicator Choreographer	Self-reflective participant

In general, there is an agreement that the PALs are closely working with the field as well as with academic expertise.

Also, some roles were less represented although they might play an important role:

- **Self-Reflexive Participant**

Every participant should pay close attention to the perspectives, needs and forms of knowledge other participants might bring into the process. WP 3 will sensitise the participants regarding this matter throughout the process and will offer methods and background to integrate.

- **Choreographer**

PALs need to be aware that they arrange and document the process including a translation, WP3 can only offer support in that.

- **Intermediary**

If not represented internally, it can be valuable to invite actors to take over roles that are covered to a lesser extent by the PALs such as the intermediary. Participants who are knowledgeable in several domains (farming practices, policy, funding, ecological services, …) could be supporting knowledge integration and bridging the boundaries of different knowledge systems.

- **Coordinator**

Coordination tasks such the planning, adapting workshop preparations to the local conditions, the organisation of infrastructural matters and their implementation as well as the contact to the stakeholders and the communication with them are important tasks that determine the success of the ERLLs. The share of regionally determined coordination that is required in each PA cannot be carried out by WP 3. Thus, it is very important that PALs acknowledge their coordinative responsibilities. A continuous exchange between WP 3 and PALs is necessary on how capacities can be distributed for an effective implementation of the ERLLs in each PA.

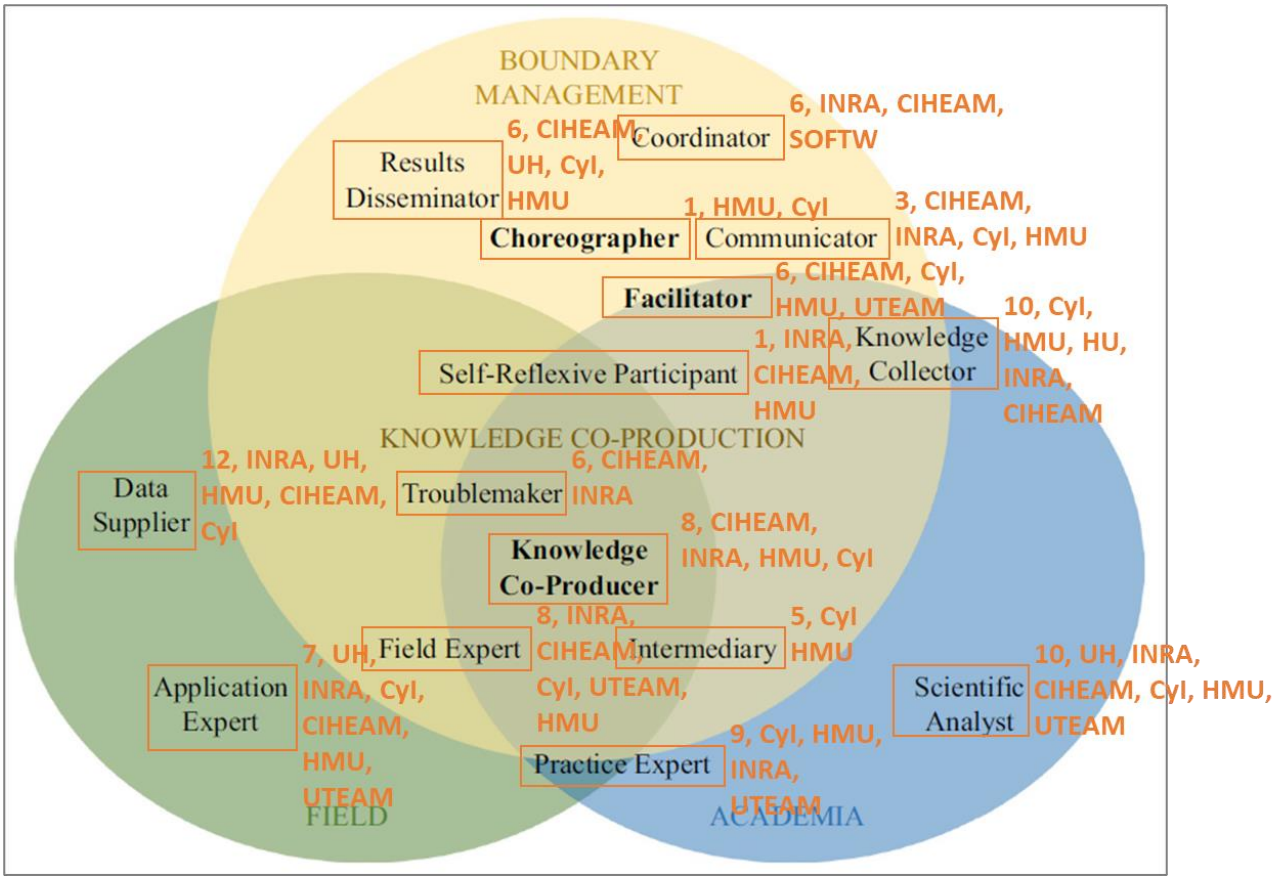

Figure 13: Presentation of the roles that the PALs (UH, INRA, CIHEAM, UVEG, HMU, UTEAM, Cyl,) are (1) meant to take on in the view by the participants of the workshop (partners working in thematic WPs and PAs), each mention is indicated with the superscript number. (2) The orange colour indicates the view of UO / WP 3. mention is indicated with the superscript number. The roles that each partner institution representing a PAL wants to fulfil is expressed with the partner acronyms next to the number count.

End users / farmers

Workshop participants share the opinion that stakeholders mainly cover roles that are applicable to the field, bringing in their practical experience, giving access to data and information as well as are possible applicants of developed restoration actions. It should be noted that SHs are only likely to participate steadily, if also their interests and needs are satisfied and they feel that their time constraints and concerns are taken seriously. Thus, all project partners need to be aware that the supply of data, expertise, and networks requires some degree of reciprocity based on the interests of the end users which need to be heard, regularly checked, and integrated.

Since SHs themselves have not been part of this survey, an enquiry on the role perceptions of the different SHs should be following during the workshops of the ERRLs. Possible methods and guidelines will be supplied by WP 3.

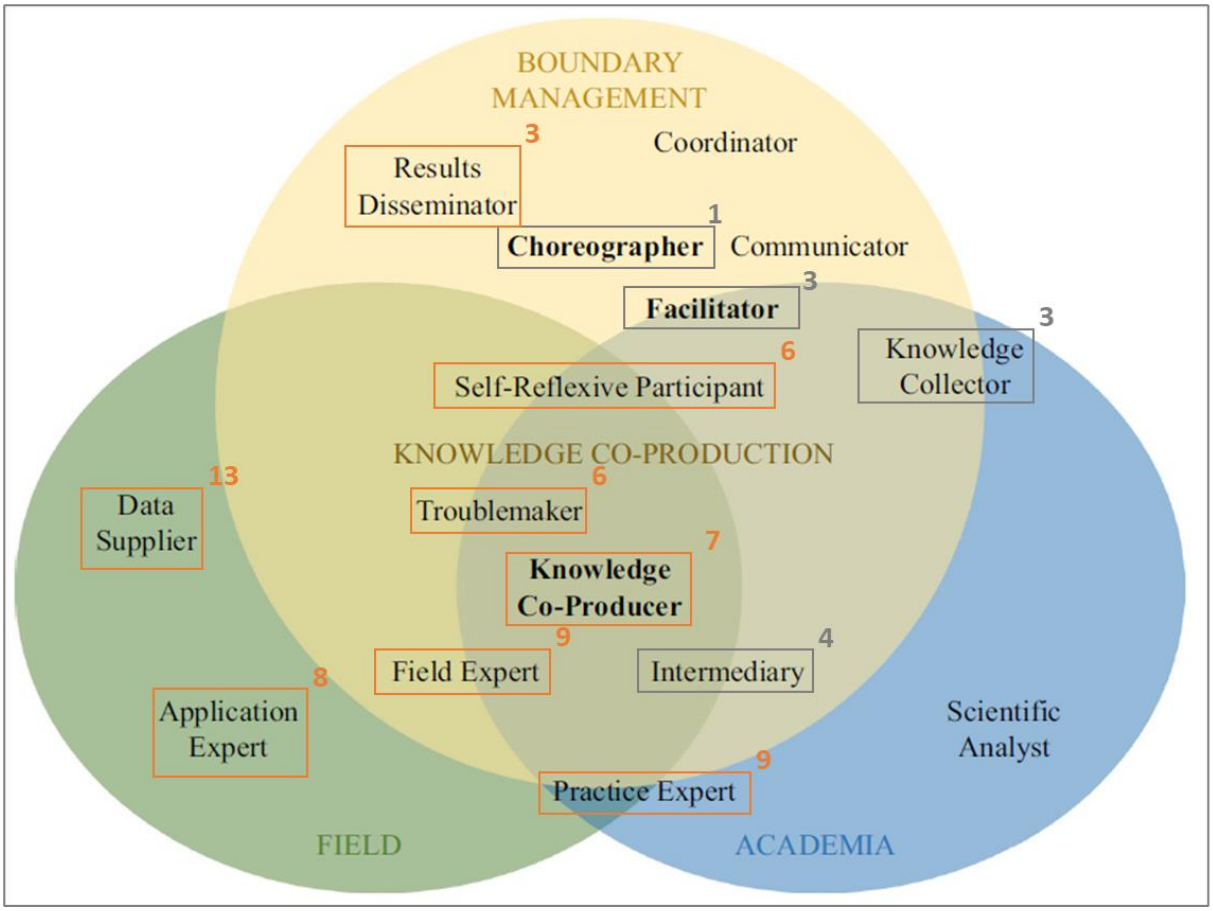

Figure 14: Presentation of the roles that end users / farmers are (1) meant to take on in the view by the participants of the workshop (partners working in thematic WPs and PAs), each mention is indicated with the superscript number. (2) The orange colour indicated the view of OU / WP 3. Please not, that self-perception is not presented here since no end users participated in the task.

Policy-makers

- **Self-reflexive participant**

The majority of participants have assigned the role of the self-reflexive participant to policy makers. It is crucial that being aware of one's own underlying assumptions, knowledge systems, and worldviews is a task for all participants of the ERLLs (project partners and SHs alike) and should not only lie in the responsibility of the participating policy makers. Every participant needs to pay close attention to the perspectives, needs and forms of knowledge other participants might bring into the process.

- **Results disseminator**

Most participants expect policy makers to disseminate the outcomes of the ERLLs. Whether policy makers and government officials are suitable for this role should be investigated during one of the workshops in the ERLLs. Also, it could be considered whether others suitable results disseminators are invited to certain activities to tap on additional channels for dissemination.

Since SHs themselves have not been part of this survey, an enquiry on the role perceptions of the different SHs should be following during the first WS of the ERRLs. Possible methods and guidelines will be supplied by WP 3.

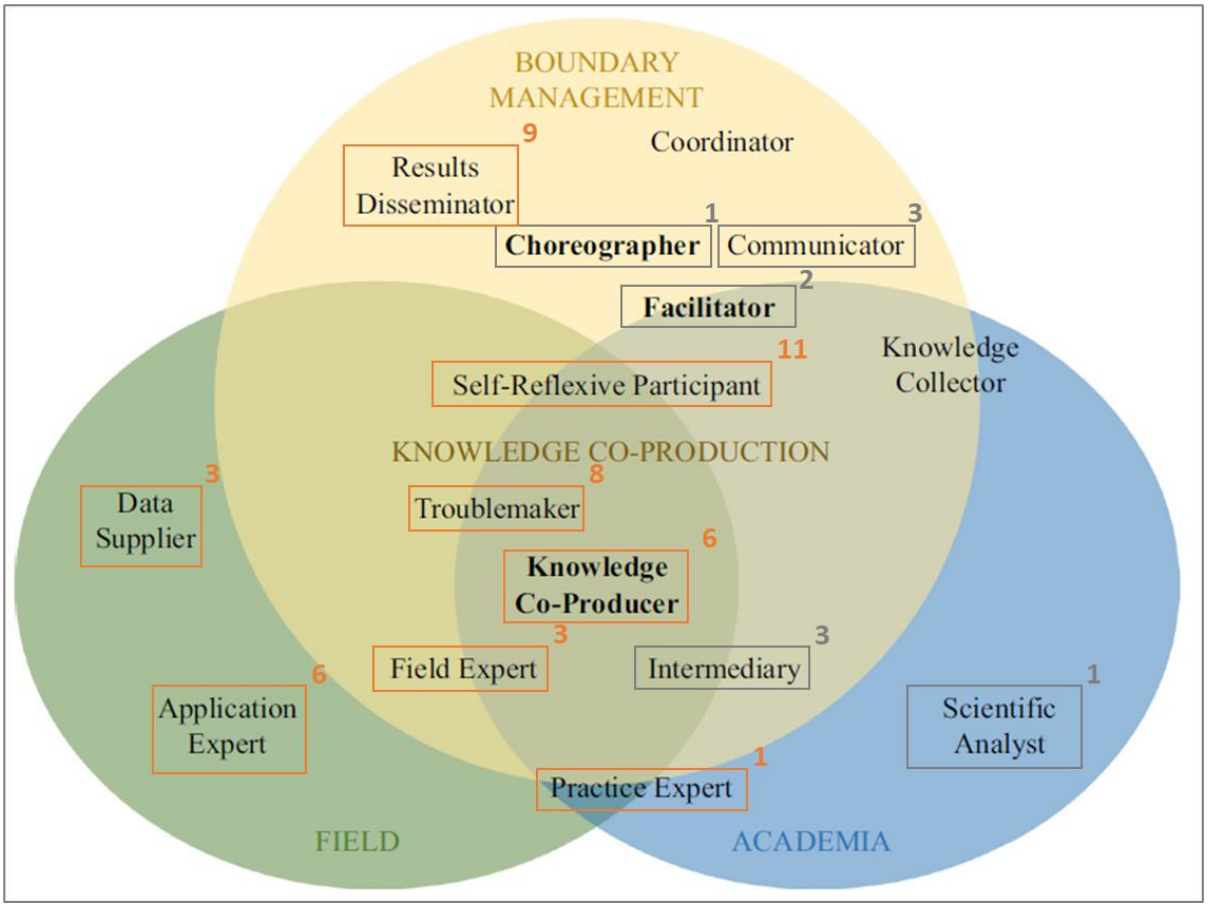

Figure 15: Presentation of the roles that policy-makers are (1) meant to take on in the view by the participants of the workshop (partners working in thematic WPs and PAs), each mention is indicated with the superscript number. (2) The orange colour indicated the view of OU / WP 3. Please note, that self-perception is not presented here no policy-makers participated in the task.

Overall conclusion on roles in the ERLLs

The concept of the different roles can help to pre-conceive which roles are relevant at which stage of the process. When relevant roles are missing at a certain stage, it should be considered, who could fill in that role for a certain phase (also an external actor can be invited to take over that role). Also, transparency is important in order to prevent conflicts due to implicit expectations or situations in which responsibilities collide or are not clear.

As visible in the tables in the sections above, the following roles offer opportunities to reassess the understanding of different roles. In the table below, the project coordinator is left out, as the project coordinator's role regarding the ERLLs that differ from PALs or thematic WPs:

	externally expected, not necessarily internally expected internally expected, externally not expected*		
	Knowledge co-production	**Boundary management**	**Academia**
WP 3		Results Disseminator Coordinator*	Knowledge Collector
Thematic work package partner (thematic WP)	Self-Reflective participant Knowledge Co-Producer	Facilitator Communicator	Knowledge Collector
Scientific pilot area leader (PAL)	Self-Reflective participant Intermediary	Coordinator	
End users / farmers	Self-Reflective participant Knowledge Co-Producer		
Policy makers	Self-Reflective participant	Results Disseminator	

3 Pilot Areas (PAs)

The PA were chosen for their capacity to implement large-scale restoration actions and for the potential for long-term organic support beyond the project's lifetime. The selected restoration actions are diverse, targeting various forms of land degradation such as soil erosion by water, soil salinisation, and loss of biodiversity. Techniques to combat these issues include conservation agriculture, terracing, cover crops, forestation, and irrigation technology.

The PA are briefly described, highlighting the specific challenges faced and the restoration actions employed to restore degraded land.

3.1 Bethlehem of Galilee, Israel

Background and problem situation

Agriculture in Israel is a strongly developed, technology-oriented industry that produces both for domestic consumption as well as export. Since most Israelis, including the farmers, have served in the military, they are well trained in handling different technologies. Despite the presently increasing erosion of agricultural soils due to the intensive agriculture, the majority of farmers as well as the Ministry of Agriculture do not pay attention to soil health at the moment. The ministry's main focus is on research and farm support in the development and application of cutting-edge farm technologies. The lack of an explicit economic valuation of healthy soils, the short-term focus on profitability, the need for high productivity and a general lack of awareness for the various services that soils and biodiversity are providing are all reasons for the negligence of soil conservation practices in agriculture in Israel.

Restoration action

The aim of the restoration activities in Bethlehem of Galilee in the Northern part of Israel is to both sensitise the stakeholders on the importance of soil health and to offer viable solutions to restore and preserve soil by applying conservation agriculture. For this, the PA consists of two sites with different thematic focuses. On the one hand, a food forest with a naturally occurring ground cover represents an ideological ambition and enthusiastic future. The food forest is part of a multifunctional space and hybrid organisation providing diverse socio-cultural and environmental services, products, and income sources. The food forest was

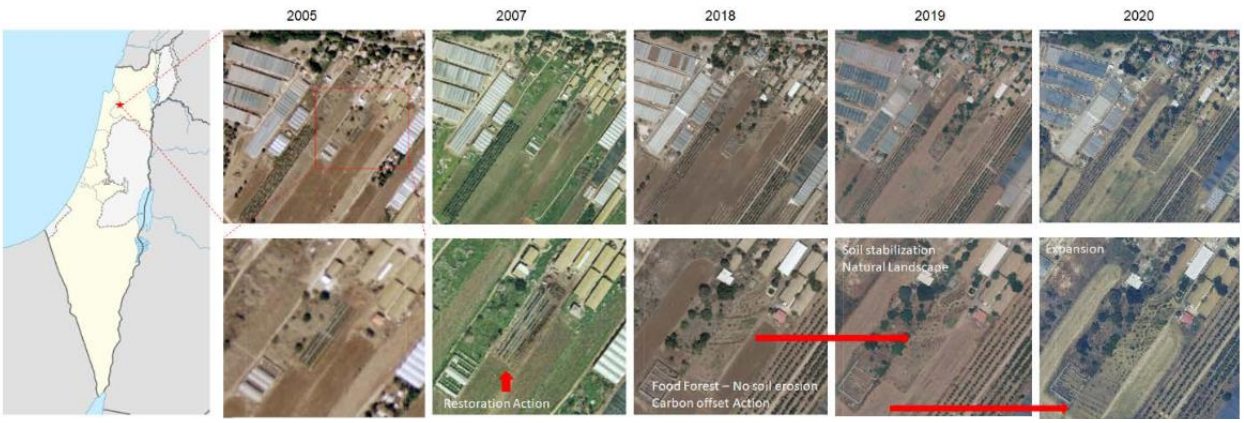

Figure 16: Development of the food forest illustrating the degraded conditions before the restoration action, and its impact and expansion over the past years.

established in 2017 on a site of degraded land (Figure 16:). As a method of carbon farming, it allows to preserve soil and soil biodiversity while still producing food at a lower intensity.

While the food forest serves as a holistic model for the importance of soil health, an almond orchard at the Neve Ya'ar Research Center in the Jezreel Valley is used as an experimental site to investigate the effectiveness of four different weed-control strategies under two different

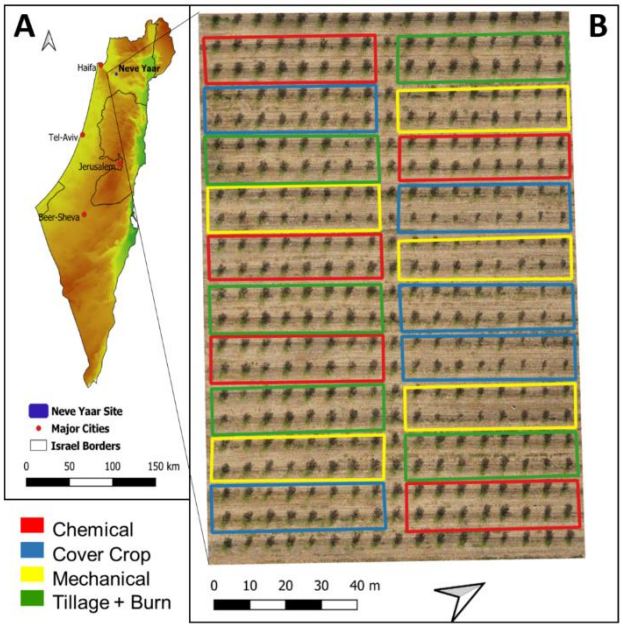

Figure 17 The experimental set-up of the almond orchard in Neve Ya'ar Research Center in the Jezreel Valley, Israel.

irrigation schemes. For this, in an experimental set-up, a single almond cultivar is treated selectively with one of four weed-control practices (Figure 17). Additionally, two different irrigation levels are compared. The development of the trees as well as their yield quantity and quality are evaluated. Within the ERLL, the benefits of conservation agriculture are quantified. This is expected to prove the added value demonstrated in less soil erosion, higher organic matter, higher biodiversity, and overall healthier soil.

Stakeholders

Since one of the goals of the ERLL in Bethlehem of Galilee is to raise awareness about the importance of healthy soils on a strategic level, the Ministry of Agriculture and Rural Development of Israel is perceived as a key stakeholder. Further important stakeholders are the food forest and Neve Ya'ar Research Center, the farmers' unions, the organic farming committee, the Ministry of Environmental Protection as well as researchers and representatives from local communities and NGOs.

Due to the war that started in October 2023, in-person workshops were not possible anymore. Therefore, the methods were adapted to fit the local circumstances. Furthermore, the situation affected the selection of stakeholders.

3.2 Cànyoles river basin, Spain

Background and problem situation

The Cányoles river basin is situated in the region of Valencia, Spain. In the past thirty years, the shift from a traditional Mediterranean rain-fed agriculture to a highly mechanised commercial production of citrus and persimmon coupled with drip irrigation and the application of herbicides led to a critical degradation of the soils. Soil compaction increased and soil erosion and run-off were enhanced by the uncovered soils. At the same time, the increased water demand and use of wells due to the shift from rain-fed agriculture and traditional flood irrigation to drip irrigation has resulted in aquifer depletion. Furthermore, the traditional agriculture terraces were removed resulting in larger fields on slopes with bare soils which additionally exacerbated soil erosion. Already, climate change affects the seasonal distribution of the rainfall and more frequent heavy precipitation events which further add to current soil erosion rates.

Figure 18 The Cànyoles River Watershed in Eastern Spain

The municipality of Montesa has been selected as the PA since it represents the described change from traditional to modern agriculture drawing on herbicides and drip irrigation. The problems in the Montesa municipality as well as in the Cànyoles river basin overall are both biophysical and socio-economic. On average, farmers are between 55 to 60 years old and most farmers have no successor. Once the land has been transformed into highly mechanised drip irrigation, also the need of workers was drastically reduced and stable employment opportunities declined. Although agriculture has a high reputation in the Valencian society, from an economic point of view it is presently the sector that contributes the least to the economy of the region. Due to economic reasons, most young people move to the bigger cities. Since the last economic crisis starting in 2006, the overall population in the Montesa municipality is in decline.

Restoration action

The goal of the Cànyoles ERLL is to demonstrate alternative strategies to agricultural soil management to tillage and the application of herbicides. In order to avoid bare soils and

prevent erosion rates, the cuttings from the trees can be directly applied to the crops as mulch covers. These chipped pruned branches are being tested and introduced as an alternative towards circular management. To increase adoption of chipped pruned branches as mulch cover, it is necessary to understand the barriers preventing farmers to adopt the practice of mulching and develop solutions together with the farming community. One important feature of the ERLL is to offer evidence on the effectiveness and viability of chipped pruned branches.

Figure 19 The application of chipped pruned branches as mulch in a plantation.

Even though on 50 % of the fields, chipped pruned branches are already used as ground cover. Mainly the bigger farms currently apply this technique. The majority of farmers is still hesitant to change their practice of drip-irrigation in combination with the application of herbicides and the burning of the pruned branches. While the circular mulching practice can reduce the expenses that arise for the removal of the pruned branches, also several barriers have been identified that currently impede adoption. An important concern of farmers is their reputation, which they strongly connect to a clean soil free of weeds and residue. Also, the monetary viability of the application of chipped pruned branches needs to be proven to them. Economies of scale favour larger farms in shifting to mulching with chipped pruned branches because this practice requires a prior investment into a powerful tractor with specialised machinery. In addition, farmers with larger property are commonly more educated, better informed and have easier access to EU subsidies. These reasons all disadvantage smaller-scale farmers to adopt the practice of mulching with chipped pruned branches.

Stakeholders

The Cànyoles river basin is not only a geophysical but also a culturally distinct region. The local language is Catalan. Some of the older farmers are illiterate which makes it essential to thoroughly design suitable workshop formats to allow for participation on eye-level for everyone involved. The main target group among farmers are smaller-scale farmers, cooperatives and trade unions that are as of yet hesitant to mulch their trees, while leading farmers of the communities already accept this practice. Thus, at the same time farmers with a bigger property are important advocates of a change in practice and play a key role as trusted community members. Furthermore, several administrative institutions from the region of Valencia (Agriculture, Environmental and Spatial Planning, Water Resources Management, Regional Forestry, Civil Protection) are included. Local authorities, environmental NGOs and members from local communities are actively involved in the research and dissemination in order to upscale the use of chipped pruned branches.

3.3 Heraklion, Greece

Background and problem situation

In the past, the European Common Agriculture Policy (CAP) supported an adequate income to farmers on Crete with its structural policies, contributing to the development of regional economies, particularly in less favoured areas. However, these very subsidies also accelerated the intensification and specialisation of agriculture which in turn led to increasing degradation of agricultural soils. Production was increased and homogenised for export while the island's self-sufficiency in products such as cereals, fruits, and vegetables was lost. Increasing free-range livestock was incentivised by higher market prices of animal products. Statistical figures for some of the mountainous communities show an increase of the total number of sheep and goats by more than 200% between 1980 and 1990. The direct impacts of the introduction of domestic grazers on native species since prehistoric times are well described for the Mediterranean islands.

Since the 1950s, large-scale migration from rural to urban areas took place, while the rural land was being over-exploited by the few remaining farmers. Today, the rural population is still declining, even though the total population of Crete (especially around Heraklion) increased in the last four decades, putting significant pressure on land for transformation from agriculture to residential or industrial uses.

The PA is situated in the municipality of Archanon-Asterousion (Peza) (Figure 20). It is rural with a mix of agricultural land uses mainly including olive plantations, vineyards as well as grazing land. The Asteroussia and Psiloriti mountains of Crete represent characteristic cases of degradation caused by intensive grazing and fires set by shepherds.

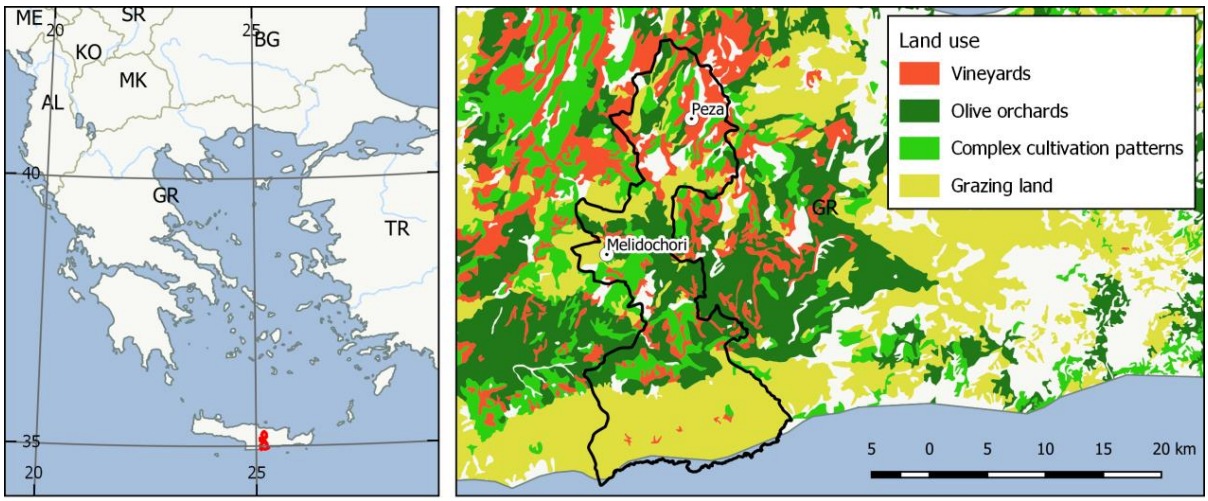

Figure 20 The municipality of Archanon-Asterousion in Crete, Greece, and agricultural land uses in the area.

Restoration action

The aim is to adopt a holistic approach to ecosystem restoration, and more specifically to afforestation projects by promoting best practices. Afforestation is possible at different elevations and slopes, however, in the early years of the plantation, irrigation infrastructure is required. At the same time, it is clear that the solutions which are financially feasible in the long run, are those that are both supported by the CAP and compatible with the local agro-ecosystem. It seems evident that farming needs to be financially feasible. Without the financial

motivation provided by the CAP, farmers would lack the incentive to cultivate the land. Thus, several afforestation measures and best practices to optimise the application of cover crops, adapted species and terraces are investigated. During the project, the best practices which are economically viable are expanded. For this, funding needs to be ensured and viable business cases need to be explored. Moreover, within the Heraklion ERLL, reasons for failure are investigated in order to decrease the risks for farmers.

Stakeholders

Important stakeholders are farmers and farmers' unions as well as Heraklion administrative agencies, decision-makers and stakeholders involved in soil and water management in Crete. Furthermore, agricultural and engineering consultancies, farming equipment providers and researchers are included.

3.4 Lower Gediz river basin, Turkey

Background and problem situation

The Gediz basin is located in the west of Turkey, where the Gediz river and its tributaries discharge their waters into the Aegean Sea (Figure 21). The area is located in the region of Izmir, the country's third largest city, and has three main rivers for irrigation. The Menemen district is located downstream of the Gediz river. Due to its proximity to İzmir, the migration of citizens from Eastern and South-eastern Anatolia has caused the population to increase in recent years. Of the working population, more than half rely on income from the agricultural sector. The majority of farmers are cotton farmers. Recently, farmers have begun to apply crop rotation. They commonly use wheat–cotton and barley–cotton rotations. Corn, melons,

Figure 21: Map of Lower Gediz Basin and its surroundings.

watermelons, and vegetables are grown as second crops, following wheat and barley in the same areas.

Increasing salinity, alkalinity and water-logging are serious problems in the lower Gediz caused by inadequate irrigation and drainage as well as salt-water intrusion, excessive tillage and overgrazing of livestock. The present drainage system dates back to the 1960s. Due to a lack in maintenance and necessary repair works in the past, it is not fulfilling its function anymore and the evaporation of saline water leaves salts in the soil. At the same time, current irrigation practices further deteriorate the soils. Since farmers often cannot receive water during the time when irrigation would be required, they often over-irrigate when water is available in the irrigation channels or by drawing on illegal wells. This further adds to the degradation of the physical and chemical structure of the soil. At the same time, urbanisation, consolidation of small lands and constructions on agricultural lands diminish the fertile area that is available for agriculture. The age of farmers is usually high (around 50) and, often, farmers do not want their children to continue farming. Likewise, the younger generation is not interested in farming as it entails hard work and is not as profitable as other opportunities.

Restoration action

The transition from the inadequate drainage and irrigation system to pressurised irrigation systems together with efficient drainage systems is believed to greatly reduce land degradation problems in the region. Thus, a drainage system is installed in a selected field in the PA. It serves as a practical demonstration site for farmers. Furthermore, capacity building is required to enable farmers to apply good agricultural practices.

Stakeholders

Key stakeholders of the ERLL are local farmers' unions, cooperatives, landowners, farmers, farm advisers, the municipality of Izmir, the Menemen Water User Association, NGOs and researchers.

3.5 Merchouch, Morocco

Background and problem situation

Of the ca. 9.2 million hectares of arable area in Morocco, 65% are sown with cereals. Population growth, a limitation of the total area available for agricultural use as well as the degradation of agricultural soils put pressure on the established food system. The current agricultural activities can be characterised as intensive, conventional tillage, posing serious problems of soil erosion, water and soil pollution and desertification. Moreover, climate change contributes to decreasing availability of rainwater in the arid and semi-arid areas of Morocco.

Despite 40 years of research at the Merchouch experimentation site and the identification of Conservation Agriculture (CA) as the best suitable farming system, the adoption of CA among farmers is still very low. CA consists of three pillars: 1) crop rotation (food legumes systems) 2) no-tillage systems and direct seeding 3) crop residue management (e. g. using straw as mulch). Emphasising the relevance of CA, in 2021, the Moroccan Ministry of Agriculture, Marine Fisheries, Rural Development, and Water and Forests set the goal to achieve of cultivation of one million hectares of cereals under CAe.

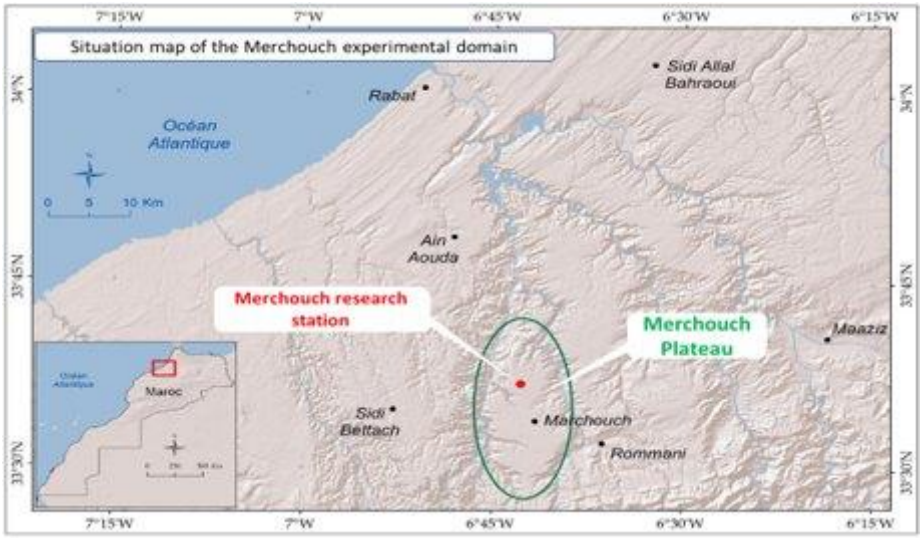

Figure 22: The location of the at the Merchouch experimentation site in Morocco.

Restoration action

The objective of the Merchouch ERLL is to increase the adoption of CA. For this, it is necessary to understand the barriers that prevent farmers from adopting CA and to propose solutions together with the community. In doing so, it is important to acknowledge that different farmers with differing sizes of farms have specific needs and capacities for adoption. A major concern is to prove CA can effectively increase the farmers' income. Also, especially young and future farmers need support with developing new business models that are profitable under the changing conditions. Concerning the empowerment of women, one important focus is to investigate whether CA can create desirable jobs for women and increase their income. At the same time, it is important to involve the Ministry of Agriculture in order to influence the design of subsidies (i.e. for no-till machinery) and the provision of seeds for farmers so that CA becomes viable for farms of different sizes.

Stakeholders

While the goal is to approach small-scale farmers, it is crucial to also involve larger farmers in the ERLL who often function as knowledgeable community leaders and are perceived as role models. The diversity in farm sizes calls for a differentiated approach, targeting each group of farmers with specifically tailored support and information. Also, power issues and local customs are important to consider in designing the different workshop formats to allow for engagement on eye-level. For instance, it has been noticed that small farmers are less likely to pronounce their opinion in the presence of more powerful farmers.

3.6 Stornara and Tarra, Italy

Background and problem situation

Stornara and Tara is a local consortium and water management authority. Its role is to distribute water to farmers by means of a large-scale pressurised and gravity distribution system. Agriculture here is highly market-oriented, producing for large market chains and for export. Due to the flat topography, the work on the farms is mechanised. The crops grown in the area and irrigated by the consortium are mainly citrus, table grapes, stones fruit, olive and

summer vegetables. Between April to September, the farmers usually strongly depend on irrigation, due to very little summer precipitation.

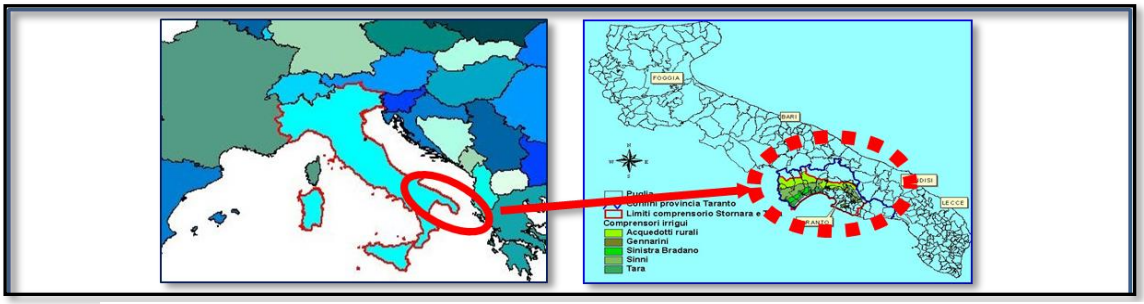

Figure 23: Location of the irrigation consortium Stornara and Tarra in the Apulia region, Italy.

The farmed area is very fragmented. The average farm amounts to 2 to 3 hectares. Also, big farms exist that range between 10 to 30 hectares, and some very large farms amount to 100 hectares. At the same time, the area is highly touristic. Many farms are family-run and farm as sideline business. As farms are continued as inheritance, farmers usually own the farmland and, hence, take the decisions. The age of farmers is high and only some have a successor. Agricultural activities are mostly carried out by men. Women are sometimes helping out with harvesting or work in food processing (e.g., packaging, selecting grapes by hand).

Water scarcity and non-adequate water supply are identified as very crucial issues. As a consequence, the main problem within the area is the over-exploitation of groundwater. During periods of intensive irrigation and groundwater pumping, seawater intrudes into the aquifer with the result of salinisation. The situation is worsened by a high number of unlicensed wells which are not controlled. Farmers rely on these wells due to the irrigation schedule, which is managed by the consortium. As delivery is in turns, which farmers have to wait and which currently amounts to 10 days. Since water gets drained or evaporates within two to three days from the predominantly sandy soils, the current irrigation delivery schedule is not adequate for the prevailing farming conditions and more efficient irrigation schemes are needed. Although farmers stress that the allocation frequency is too long, the consortium is currently not able to manage the schedule differently. Hence, there is a conflict between farmers and the consortium regarding water allocation.

Restoration action

In order to address the over-exploitation of groundwater and salinity, the restoration action focusses on the improvement of water management in terms of an adapted irrigation scheme, water efficiency and soil management, i.e. the conservation and amelioration of soil quality on farms. By trying to understand and counteract water management impediments of the consortium, the governance of the irrigation scheme should be improved. Furthermore, in order to increase the efficiency of water used by farmers, sustainable soil management practices will be addressed. Proposed practical measures include improving the water storing capacities, precision agriculture and the selection of suitable crops that are less water-demanding.

Stakeholders

For the ERLL, the main contact to the stakeholders is the consortium as the water distribution is connected to it. Apart from the consortium and its members, contact is sought to other, non-associated farmers.

3.7 Tamia, Egypt

Background and problem situation

Fayoum governorate is a large depression located about 90 km south-west of Cairo. Tamia area is an important centre in the region. Agriculture is mainly small-scale and farmers produce for local markets. Common crops are wheat and fava beans in winter, maize in summer. Other common agricultural products are beets, sunflower, cotton, tomatoes, melons, fruit trees such as mango and orange trees.

The main challenges in the region are salinity and climate change. Mismanagement of agricultural fertilisers and pesticides, reuse of drainage water for irrigation, waste-water disposal and inadequate land use planning have major negative impacts on groundwater and soil quality in the study area. The aquifer is contaminated with agrochemicals while many agricultural soils display signs of water-logging and salinisation.

Restoration action

The goal of the ERLL in Tamia is to maximise water and fertiliser efficiency in order to decrease salinity, better adapt to climate change and increase the productivity of agricultural lands. In order to do so, it is crucial to assess soil erosion in these areas and design appropriate strategies for soil conservation.

For this, experiments on the farms will be conducted which aim at optimising the irrigation and fertigation schedule and treatments in order to reduce the salinity of the soils. In a former project SALTMED, a tool has been developed to predict the distribution of salt in soils. With its help, indications for appropriate irrigation requirements are developed. During the ERLL, the experimental sites are used to prove that remediating the soil and improving the yield is possible if the correct measures are applied.

Stakeholders

Important stakeholder groups for the ERLL are farmers, extension officers, the agricultural administration of the Fayoum government as well as the Ministry of Agriculture. Some of the older farmers are illiterate which makes it essential to thoroughly design suitable workshop formats to allow for participation on eye-level for everyone involved. The first step is to connect to farmers that are interested in participating in remediation measures with their fields. For this, the government of Fayoum is key as an important contact point to farmers.

3.8 Troodos Mountains, Cyprus

Background and problem situation

Due to a mean slope gradient of 31%, agriculture in the Troodos Mountain region is typically practised on dry-stone terraces. Farmers produce apples, cherries, peaches, and nut trees (e. g. almonds and hazelnuts) and, to a lesser extent, citrus trees, olives trees, and grapes. Cyprus' agriculture suffers from an ageing farm population, the average age of farmers is 59 years. Due to comparatively small farm sizes of about three hectares, land fragmentation also poses a challenge. The ageing farming population and land fragmentation are more profound in the

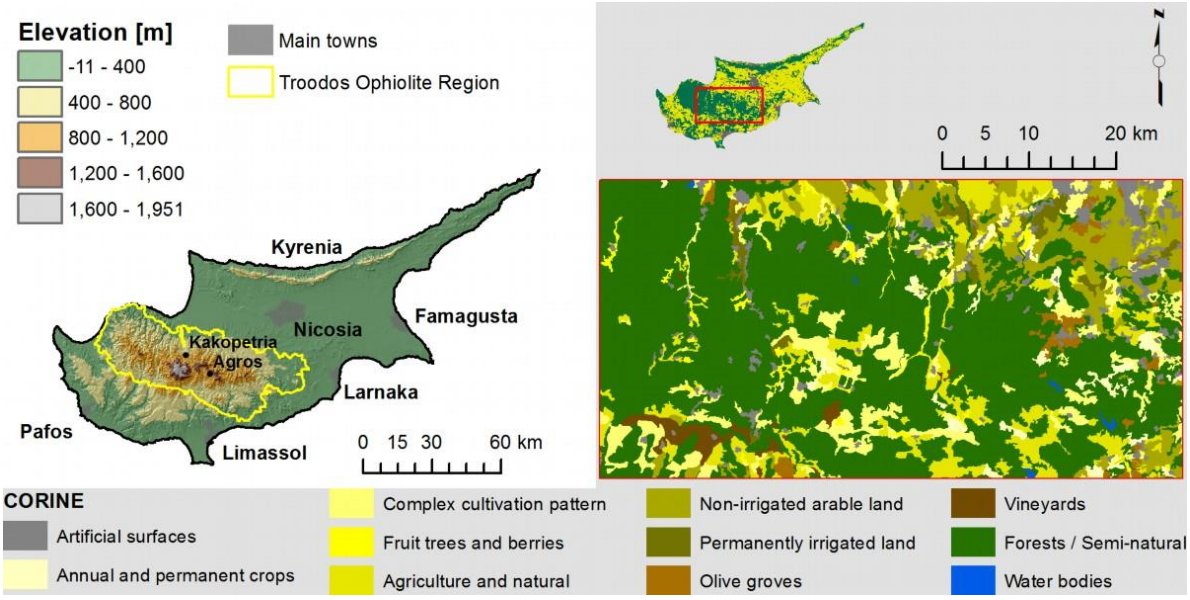

Figure 24: The Troodos Mountain region in Cyprus.

Troodos region than in the plain. The remaining farmers cannot maintain the production on existing agricultural land and many fields are abandoned. Owing to the lack of maintenance, soil erosion and degradation of abandoned dry-stone terraces can be observed throughout the mountains, sometimes leading to the complete collapse of once productive hill-slopes. Another recent development has been the utilisation of diggers and bulldozers to construct terraces in many areas in the Troodos Mountains. The use of heavy machinery to create new terraces is currently not controlled. The absence of guidelines for designing sustainable structures results in costly construction and maintenance and increased agricultural production costs. In some cases, the mechanised construction of terraces leads to adverse environmental impacts. As a consequence, despite the fact that dry-stone constructions are on the list of Intangible Heritage recognised by UNESCO, current developments simultaneously lead to soil erosion and the loss of traditional knowledge.

Restoration action

In order to support sustainable mountain agriculture and combat soil erosion and land degradation, the goal of the ERLL in the Troodos Mountains is to safeguard the beneficial effects of dry-stone terraces through terrace rehabilitation. Although the EU subsidy system supports farmers for terrace conservation, restoration and maintenance, the current funding

does not allow for effective conservation in practice. Identified challenges are high production costs, low response to market demands and limited development opportunities. Furthermore, the policies that support the maintenance of terraces differ according to the products that are farmed. Likewise, dry-stone terraces themselves are extremely variable depending on the specific site and its geology, the crops produced (and their varieties) and the growing method applied. This adds further complexity to structuring the participation process. Initially, the ERLL focusses on the production of grapes, as the crop that is most common.

The goal is to further strengthen the effective institutionalisation of the practice. This entails the development of a support tool for the creation and restoration of terraced areas, hands-on capacity building events to expand the required skills as well as the identification of measures to improve the fertility of terraces. Furthermore, policy guidelines and a long-term funding strategy are established.

Stakeholders

Relevant stakeholders for the ERLL are farmers' unions, SME farmers, Ministry of Agriculture and of Rural Development and Environment, village authorities and the Troodos Development Company.

4 Participatory assessment pathway

The participatory assessment pathway illustrates the methods, approaches and their adaptations that were chosen to address the different thematical focuses of stakeholder engagement in REACT4MED. These methods and approaches were either used to prepare the stakeholder engagement process or have been implemented as interactive sessions during the ERLL workshop series. Their conceptualisation, planning, preparation and implementation followed a stepwise, iterative process introduced in Chapter 2.3.3.

In transdisciplinary projects, three main types of knowledge are created in order to onset a transition from one state to another: system knowledge, target knowledge and transformational knowledge (Schneider et al. 2019a; Pohl und Hirsch Hadorn 2007). In the REACT4MED project, the creation of these types of knowledge guides the participatory approach:

1. System knowledge: The main
2. Target knowledge
3. Transformational knowledge

In the following, an overview on the different objectives of the participatory activities, the methods that were selected to meet these objectives and the resulting preparation materials is given. After each method or approach is introduced, exemplary results from the ERLL workshops, where appropriate, are described and compared.

4.1 Preparation of the participatory approach

4.1.1 Stakeholder analysis

Aim of the stakeholder analysis

With the help of a stakeholder analysis for every PA, it is possible to identify those stakeholders who might be interested in implementing restoration actions, who can assist the dissemination of project relevant information (from the project to stakeholders and vice versa), and who can contribute knowledge to the activities of the ERLLs. Their social capital might include the following aspects:

- ability to implement the restoration action,
- practical knowledge,
- target, system and transformation knowledge,
- financial and technical resources,
- networks/contacts, or
- political influence.

When identifying stakeholders, we aim to find "blind spots" and fill gaps accordingly, mix diverse perspectives, and counteract marginalisation of relevant groups by actively stimulating equality. The involvement of stakeholders should start as early as possible to create a lively interaction within the ERLLs.

Approach of the stakeholder analysis

1. **Step: PAL survey (baseline: direct contacts)**

In this step, the PALs should first answer the following:

- Which groups of stakeholders are relevant to your PA?
  The PALs could add to a predefined list including: farmers, land owners, forestry, water management, farm advisors / extension officers, policy-makers, administration, researchers, education, environmental protection and conservation, business
- Relative farm size for the PA

After having defined these aspects, PALs should add all stakeholders to who they have had contact in the past and of whom they know who might be relevant to the up and outscaling of their restoration action or to their PA. For the most important 10 stakeholder of each stakeholder group, they should detail the following aspects, while only list the other remaining stakeholders.

- SH group
- Name
- (Job) position
- Organisation (if relevant)
- Farm advisor or policy maker: area of expertise / level of responsibility
- Farmer: Farm size (select from pre-defined list)
- What was your contact with the stakeholder so far? (e.g. joint project, contact in working group 'conservation agriculture', online contact, etc.)
- In your opinion, what are the topics that concern the stakeholder regarding agro-environmental management and restoration actions?
- What is their educational/training background?
- Which interst does the stakeholder have to participate in the Living Labs? What will they gain from it? What motivates them to continuously engage?
- Of which networks is the person a member or does engage in? (e.g. farmer organisation, regional working group 'water conservation', etc.)
- Please describe the influence that the stakeholder has (e.g. network, reputation, property size, financial resources, decision-making authority, etc.)
- Please indicate whether the stakeholder can be considered a champion (or a role model) for your restoration actions

2. **Step: Understanding the circumstances**

In order to be able to guide the process of the stakeholder analysis, we conducted interviews with the PALs in which we addressed the following questions:

1. What is the aim of your ERLL?
2. What do you expect from the stakeholders in your ERLL?
3. Which farmers do you consider your target group: what do they grow, what are their farm sizes (upper / lower limit)

4. Are these persons willing to participate in the workshops? If not, what would make them interested in joining?
5. What do you expect from the workshops and from us as organising support?

Furthermore, PALs were asked to add the following aspects to their stakeholder list:

- Distinction in Decision-making level (policy-makers)
- Age (selection from list: under 30, 30 – 50, above 50)
- Gender
- Role of participant in the ERLL (What is their interest? What do you expect that the stakeholder contributes to the ERLL?)

3. Step: Stakeholder Selection Process

Once the list is finalised, PALs were asked to select stakeholders according to the following criteria in order to define the list of invitees for the first stakeholder workshop:

- 50 % of the participants should be occupied with practical farming (farmers or farm advisors)
- Of the farmers, 1/3 should have already implemented the restoration action in question, 1/3 should be interested in implementing it in the near future, 1/3 should be interested in being informed but showing little interest in changing their practice.
- 30 % should be women and people of young age, who are able to represent themselves in a potentially hierarchical environment (e.g., business leaders, persons in higher positions of the administration)

4. Step: Snowballing

During the workshop or in direct interviews with stakeholders, PALs should extend the stakeholder list. Guiding questions of the exercises are:

- Who are central actors with regards to soil conservation and restoration (planning, implementation, know-how, dissemination…) and which competencies do they bring in?
- Looking at the participants of the workshop:
    - Who is not yet present, who could give valuable input to improve soil conservation efforts?
    - Who can contribute to make the Ecosystem Restoration Living Lab successful?

Stakeholders were asked to provide the following details on the stakeholders that they recommended to include:

- Name of stakeholder
- Name of stakeholder's organisation
- Contact details (if known)
- Which role (competencies / responsibilities) does the stakeholder play with regards to soil conservation and restoration?

- What is the stakeholder's topic of involvement in the area? (select from list: Agriculture, Education, Water management, Forestry, Environmental protection and conservation, Land use policy and planning, Community development, Supply chain, Research and Development, Other, please specify)

4.2 System knowledge

Within the first interactions between stakeholders and scientific project staff, questions regarding the problem that the project aims to solve are addressed. Within the first ERLL workshops, stakeholders and scientific staff came together to assess the problem situation jointly (4.2.1). Furthermore, they joined in a discussion on how stakeholders and scientific staff could contribute in the project activities (4.2.2). As stakeholders have not taken part in the definition of project activities, this step is needed in order to make the project activities meaningful to all persons participating in them. The decision support tool LanDS was furthermore discussed within the first workshop (4.2.3). The tool provides an empirical assessment of areas in which restoration actions may be implemented and supports as such the refined assessment of the problem.

4.2.1 Problem definition (rich pictures)

Description of the 'rich pictures' method

Purpose	A rich picture illustrates the richness and complexity of a given situation. By collecting inputs from different perspectives, it aims to help participants perceive the complexity of the entire situation. Participants from various backgrounds can bring in their perspectives, at the same time they visualise the perspectives brought to the table by other participants. The method is used to make various aspects of a problem situation, interconnections and influences quickly visible in order to identify aspects the project should focus on or address. Drawing rich pictures is thus a first step to structure the messiness of the problem situation in reality and builds the basis to decide upon areas of interventions that a project wants to focus on and what needs to be considered in doing so. The method offers a non-threatening and humorous way to illustrate perspectives and conflicts. Even though drawing can be the most efficient way for some, basic symbols and text can also be used.
Preparation and materials	• Name tags marked for different groups (e. g. colour dots or colour of paper) • Guiding questions for facilitators (one facilitator for 5-7 people) • One table per group on which a big sheet of paper is lying. • 6-8 chairs around one table so that every participant and the facilitator have good access to the sheet of paper • Pins or masking tape to attach the posters on the wall afterwards • Every participant has a colourful marker in their hands • More markers are available at the table

	• Every group is accompanied by a facilitator and a minute taker
Steps	1. The participants take place on the table to which they are assigned (indication on their name tags). 2. Short introduction by the PAL to the idea and structure of the rich picture method, its rules and its goals (question to answer) to the plenary. 3. In the groups: • Start with the basic problem situation (degraded soils). • The participants in a group jointly illustrate the problem situation from their various backgrounds and experiences. • Participants illustrate their perspectives and explain them as they draw. Ideally drawings, and symbols should be used, text should only be used as a fall-back option. • Although discussion is not encouraged, participants can react to the contributions of others in written/drawn form. • Write down the 5 main challenges arising from your rich picture. 4. Afterwards, the groups come together in the plenary. The facilitators briefly present what their groups have found out about the problem and what is important to them based on the 5 identified main challenges. 5. After the plenary, the pictures are put on walls so that participants can go back to them during the breaks. 6. The discussions will be digitalised and send to the participants after the workshop.
Questions assisting the process **(as a print out on each table)**	Main question to be defined by PAL, e.g., "What causes soil degradation in agriculture?" • How are you affected by the problem? How can you influence the problem? • Where do the problems come from? Draw the context, the causes and effects and any other relevant social, economic, political, environmental feature or issue. • Which other stakeholders relate to soil degradation and how? Draw the relations of stakeholders to each other. • Make sure your drawing includes both facts and subjective information. • You can use a legend or some words to explain stakeholders or problems, but do not use too many words.
Output / Outcome	• Several posters illustrating a given problem situation from different perspectives. • A better understanding of the complexity of the problem situation. • An opportunity for participants to bring in their perception as well as perceive other participants' points of view. • After the workshop, the different rich pictures, should be combined to a joint picture of the problem situation. This can also be used in

	subsequent workshops to illustrate the situation as perceived by the participants.
Roles of participants	Groups should be assigned in ways that participants meet that otherwise do not frequently work together in order to combine different perspectives in one group. As all participants possess knowledge on (aspects of) the problem situation, each perspective is equally relevant and will contribute to a common understanding of the problem situation. Participants should contribute to the rich pictures ideally in drawn contributions. If participants are not willing or able to participate in this way, the facilitator should take up their verbal contribution and paint/write this on their behalf.
Role of facilitators	• Encourage all participants to draw their point of view on the paper. Make sure that everyone participates. If someone does not participate, assist the person by drawing for them. • It is not the goal to start a discussion, but to show one's own perspective and hear the perspective of others. Tell participants that they should rather draw than discuss their perspectives. While drawing, they may explain what they draw and therewith make their point clear.
Origin	Developed by Peter Checkland as one of the early steps of his Soft Systems Methodology
Further resources	https://naturalsciences.ch/co-producing-knowledge-explained/methods/method_factsheets/rich_picture Brouwer and Brouwers. 2017. The MSP Tool guide - The MSP Tool Guide: Sixty tools to fac multi-stakeholder partnerships. https://mspguideorg.files.wordpress.com/2021/12/msp guide-wur-wcdi.pdf

Exemplary results

Figure 25: Rich pictures depicting the problem situation as perceived by participants in the ERLLs in Cyprus, Greece, Israel, Italy and Turkey.

The implementation of the rich picture method requires a certain openness for unusual approaches. Most adults are not used to draw what they would like to share. Hence, also in the PAs some resistance towards the method arose. We could observe two different approaches to the task. In one group of the ERLLs, PALs carried out the session as described in this guide, resulting in the pictures as presented in Figure 25. In the other ERLLs or one group within the ERLLs in the case of Morocco and Israel, participants discussed with each other without drawing their perceptions of the situation. In Spain, the discussion points were documented. In Egypt, no rich pictures were drawn. Instead, the participants were asked, which were the obstacles to agriculture and whether stakeholders perceive any problems. In one group in Morocco, participants drew their perceived problems, but in isolation from the others. Hence, no interrelations are presented. These approaches are illustrated in MS 3.1 Documentation of the first series of ERLL Workshops: Internal ERLL workshop report.

Figure 26: Alternative sessions to the rich picture in the ERLLs in Spain, Morocco, Egypt.

In Figure 27 we see the juxtaposition of the two approaches as applied in Israel. While on the left-hand side, participants focussed more on the discussion, the picture of the right-hand side represents the drawing which is produced as a form of a written discussion.

Figure 27: Two pictures resulting from different approaches in the Israeli ERLL.

Based on the pictures, participants formulated their five most crucial issues regarding the land degradation situation. Those issues that are mentioned in at least two ERLLs are presented in Table 1.

Table 1: Common problems as identified in the eight ERLLs.

Problems identified	**Countries**
Extreme weather events (drought, intense rainfall)	Cyprus, Greece, Spain, Israel, Turkey, Morocco, Egypt
Lack of knowledge on good practices	Cyprus, Greece, Spain, Turkey, Morocco, Egypt
High costs and low profitability of agriculture	Cyprus, Greece, Spain, Israel, Turkey
Intensive agriculture	Greece, Spain, Israel, Egypt
Soil erosion	Cyprus, Spain, Israel, Turkey
Fragmentation of farmland	Cyprus, Greece, Turkey
Monoculture	Israel, Morocco, Egypt
Lack of environmental awareness	Greece, Israel, Turkey
Lack of personnel	Greece, Spain, Cyprus
Lack of regulation	Israel, Turkey, Cyprus
Pollution of water resources	Turkey, Egypt, Italy (only groundwater)
Removal of organic matter	Greece, Israel, Morocco
Subsidies insufficient	Cyprus, Spain, Morocco
Ageing farming population	Cyprus, Greece
Bureaucracy as a burden for farmers	Italy, Morocco
Conflictual relationship between administration and farming	Greece, Israel
Difficult terrain for farming	Cyprus, Greece
High energy costs	Italy, Morocco
High price for good practices	Spain, Israel
High water table	Turkey, Egypt
Land use change (reduction of arable land)	Greece, Turkey
No successors in farming	Greece, Spain
Non implementation of existing rules	Greece, Turkey
Overgrazing	Greece, Morocco
Saltwater intrusion through groundwater use	Italy, Turkey
Small plot size	Cyprus, Spain

4.2.2 Feedback by stakeholders on REACT4MED activities

In order to design the activities in the ERLLs in a way that stakeholders have an interest in continuous participation, in the first workshop we aimed to gather stakeholder input and opinions on the defined project activities. The purpose was to get more information on what makes the project's activities meaningful to the stakeholders in order to consider these factors in their further development. Well-tailored activities motivate stakeholders to continuously engage. Also, it is an opportunity to receive insights on factors that researchers did not anticipate and yields more robust results. Early feedback on the use of activities also increases the chances that the results are useful for the stakeholders. For this, stakeholders were asked, what is required for the various project activities to be of value to them.

Description of methods

Option 1 - Silent discussion

Purpose	The method silent discussion is used to activate all participants to partake in a discussion. For this, everyone takes turns in contributing their ideas, knowledge and opinions in written form on posters for different topics that have been prepared in advance. Contributions by participants that have already been written down can stimulate further thoughts and hence a similar effect as of a verbal discussion is reached, in a documented form.
Preparation and materials	• Five tables are prepared, each with a large paper on the five different project activities. At each table, several markers are available. • One paper is prepared for each of the activities (field experiments, LanDS design and co-creation, indicators and metrics, assessing good practices, capacity building workshop) in this form: Title: What is required of [insert respective activity] to be of value to you? On the bottom: Who would like to engage in this activity? • Print out of the respective activity descriptions on the table.
Steps	1. The participants gather in equally sized groups around the tables. 2. The PAL gives a short presentation on the project activities and introduces the method and rules of the **silent** discussion: • Written contributions only. • Participants can and should react to what others wrote: They can use lines, arrows or symbols to illustrate the connection between different points. • The contributions should remain focussed on the questions. 3. The participants start writing their comments on the paper. Facilitators should remind the participants to remain focussed on the paper. 4. The participants are asked to walk through the room and add to the silent discussion on all activities they find interesting and relevant.

	5. The discussions will be digitalised and send to the participants after the workshop.
Question	What is required of the project activities to be of value to you? Who would like to engage in this activity?
Output / Outcome	• Written stakeholder input to the project activities regarding what is important to the stakeholders and indications for adaptation to local circumstances. • Identification of potentially interested participants for the following activities.
Role of participants	• Contribute their ideas and opinions regarding the presented project activities. • Discuss with others silently.
Role of facilitators	• Help to maintain a silent and comfortable atmosphere. If participants start a discussion off paper, they are reminded that they should instead contribute their thoughts in writing. • Remind participants that they can add and relate to what other people have written. • Encourage participants to change the tables and come back at a later stage in order to react on other comments.

Option 2 - Break-out groups

Purpose	As in some contexts, stakeholders of different stakeholder groups are not likely to speak up and discuss with each other, break-out groups of similar stakeholders should be formed in which the activities will be discussed and thus feedback gathered.
Preparation and materials	• Posters/flip-charts to collect the feedback of participants • Flip-chart pen
Steps	1. The facilitator refreshes the memory of the participants on the activity in discussion. 2. The facilitator asks the participants “What is required of the activity to be of value to you?” 3. The facilitator gathers the points that participants raise on the flip chart and encourages those who have not shared their views yet. 4. The facilitator asks the groups who would like to engage in the activity and notes down the names. 5. Repeat point 1-4 with next activity.
Questions	What is required of the project activities to be of value to you? Who would like to engage in this activity?

Output / Outcome	• Written stakeholder input to the project activities regarding what is important to the stakeholders and indications for adaptation to local circumstances. • Identification of potentially interested participants for the following activities.
Role of participants	• Contribute their ideas and opinions regarding the presented project activities. • Discuss with others.
Role of facilitators	• Summarise the activities before starting to collect stakeholders' feedback. • Help to maintain a comfortable atmosphere. • Remind participants that they can add and relate to what other people have written. • Encourage participants to voice their opinion.

Exemplary results

This session was carried out in three of eight PAs for various reasons. Reasons for omission were lack of time and avoiding the interruption of the flow of thinking from problems to solutions. In two of the three PAs in which the session has been carried out, the questions that were posed to the participants varied and were directed to generate general feedback by participants. Some PAs included questions into the evaluation questionnaire. Here, the effect of getting inspired by comments of others and the discussion of these cannot unfold. The question "What is required of the project activities to be of value to you?" as it was posed In the Israeli PA, yielded the most targeted answers which specified the needs of stakeholders to make the project activities more relevant to them. In Turkey and Greece, the comments by stakeholders were rather similar to a wish list without taking into account the presented contents of the respective project activity. Table 2 presents those aspects that are relevant for tailoring the project activities.

Table 2: Contributions of stakeholders to project activities. Presented are contributions in the Greek, Israeli and Turkish ERLLs. The contributions were partially rearranged, irrelevant contributions were deleted.

Activity	PA	Feedback
Restoration actions	Heraklion (GR)	Green manure
		Foresting degraded lands
		Land restoration
		Water resources management
	Bethlehem of Galilee (IL)	On-site measurements
		Scalability
		Transparency, knowledge sharing
		Science based
		Monitoring
		Adoptive management
		Biological diversity
		Microclimate effect: cooling down cities

		Should go together with awareness and education
		Food security (in combination with quality and healthy food)
	Lower Gediz (TR)	To carry out restoration practices with practitioners and to carry out restoration projects in the light of their ideas. Prevent restoration practices from being localised and project-based. Providing demonstrative examples, not limited to the research project. Primarily, large farmers and related private sector should be included in the practices. Reducing the use of chemical fertilisers, leaning to the use of organomineral fertilisers. It is necessary to use substances to reduce the salinity of the soils and the pH ratio.
LanDS	Heraklion (GR)	People network under a common cause
	Bethlehem of Galilee (IL)	App for local use management tools
		Simple and coherent
		Monitoring kit
		Supportive community
		Choose challenging and badly treated places
		Display good examples that are working
		Make the tool accessible for all people (Language, way of presenting information)
	Lower Gediz (TR)	Supporting the data with construction and cadastral plans (establish a precedent for removal of development plans) All soil analysis data must be registered in the system in order to detect land degradation Introduction of soil amendment materials to farmers
		Water usage data such as water quality and water management
		Collection of perennial analyses such as soil analysis and data such as meteorological and irrigation efficiency Farmers, private sector, public institutions and organisations and similar actors who have the economic power to cover the initial investment of the LanDS applications should be the primary target and the outputs should guide the small farmer. Identifying potential areas that represent local problems
		To create future scenarios that can be applied against the climate crisis in the light of meteorological data Rapid separation of agricultural and industrial areas
		Identifying areas with high land degradation, sharing the effects of the applications with the related actors in the whole sector Access to the LanDS app
Indicators and metrics	Heraklion (GR)	Assessment of productivity for terraces
		Quality assessment of olive oil on non-intensive cultivations
	Bethlehem of Galilee (IL)	Developing/ measurements for soil microbiome
		Collect traditional & indigenous knowledge
		Out of the box thinking. We need some breakthroughs
		Involving asking children who love nature and spent much time in nature Easy to apply

		Include biology in soil as indicators Measure in specific seasons Long-term measurements
	Lower Gediz (TR)	Status of land degradation (holistic understanding) Regional soil analyses Besides the qualitative determination (whys, hows) of the measures, data should also be determined in the same way. Quantity will not be enough in such a case. A regional database for 5 years should be created and posted in village cafés and certain points (temperature, crop diversity, plant spacing, etc.). Monitoring the indicators in a framework of sustainability Determination of indicators requires intensive data collection and processing. Indicators should be calculable and should be determined according to the data. It is necessary to determine the practical studies of the data.
Assessment of good practices	Heraklion (GR)	Assessment on biodiversity regarding each practice Biodiversity assessment comparatively between practices correlation between biodiversity, pollution, and production Produce quality Popularity of actions with producers
	Bethlehem of Galilee (IL)	Educational for children Implementing a successful model: economically, socially, environmentally. So you can offer success to investors, promoting more restoration projects. Must be valued economically! -> but not only Sustainability Holistic Agro-management (soil, produce, biodiversity, economics) Possible costs for local adaptation and modifications Must be legal and authorised by policy makers (ministry of health, environment & agriculture) Good impact on the environment, look at watershed scale implementation
	Lower Gediz (TR)	Conducting intensive farmer interviews for socio-economic scenarios An economic analysis of restoration actions should be made and should be sustainable. Development of solutions based on economic, social, environmental and institutional basis for the proposed restoration actions. Financing of good practices Qualitative benefits and results should be emphasised as well as mathematical (quantitative) results. Conscience and mind must be addressed at the same time. As a result of restoration works, necessary production planning should be made to prevent land degradation. Encouraging laws should be made or support should be given in this direction.
Capacity building	Bethlehem of Galilee (IL)	Specificity to soil type, climate, crop etc. Listening to and involving farmers

	Relevant, large network (active communication, global connection) Action plan both on farmers level and on governmental level Involving large-scale farmers Offering guidelines
Lower Gediz (TR)	Organising technical trips to see successful applications on site. Strengthening and activating the network among decision makers, local governments, farmers, university, research institutes, NGO's. Dissemination of results to wider audiences through the press (TV, magazine, posters etc.). It should be ensured that farmer unions and other NGOs are given training and effective tasks on the application of new agricultural technologies. The results of the workshop must be disseminated (Supports, trial areas, extension studies) Local administrators (municipal, public) should be involved. Dissemination of project results and successful examples visually and in writing (It could be a documentary and/or short film) Developing communication with NGOs and conducting studies for NGOs. The issue of being more sensitive in the implementation of laws and regulations should be put on the agenda. All actors in the system from production to output, such as farmers, workers, agricultural intermediaries, supply chains, and so on, should be consciously separated from hidden and wrong practices.

4.2.3 Co-design of LanDS

The co-design of LanDS is a collaboration between WP 4 as the developers of the platforms, WP 3 as the organisers of the participatory approach and the PALs. It is planned to include stakeholders in two occasions in the design of the decision-support toolbox. In the first session, a participatory session with a broad variety of stakeholders was organised. The exercise took place during the inception workshops. It consisted of two different sessions, which are described hereafter.

Description of methods

Step 1: Consolidating information on issues, actions and indicators relating to soil degradation in agriculture via break-out groups

Purpose	The purpose of this session is to consolidate information from workshop participants on soil degradation issues and restoration actions in agriculture in Israel as well as on indicators to measure these.
Preparation	• One room separate from parallel group on functionalities/requirements to LanDS • One big sheet of paper for each group • Moderation cards in three different colours

	• Tape / glue • Big pens • Pre-requisite: Clustering of information from rich pictures on issues, actions and indicators that have already emerged • Guiding questions for facilitators (one facilitator for 5-7 people) • Facilitator for each group
Steps	5 min for: 1. A short introduction of the task and repeating which information have already been collected during the session on problem definition (rich pictures). 2. The overall group is split up in break-out groups (of 5-7 people per group). Each group is assigned a facilitator, that ensures that everything that is said is captured in the poster. 25 min for: 3. Each group is starting with a selection of issues, restoration actions and indicators that were mentioned during the problem definition. Each group receives moderation cards in three different colours (each group has the same selection of colours: red, blue, white). Each colour stands for one of the criteria (issues, actions and indicators) 4. Participants are asked to illustrate existing soil degradation issues (red), restoration actions (blue) and indicators to measure issues and performance of restoration actions (white) on differently coloured moderation cards. They should group and cluster them. 5. The groups are also asked to illustrate the relationship between the different information they come up with (what can a certain indicator measure according to them?). Hence, the moderation cards are fixed (with glue) on the large paper. Arrows, lines and symbols can be used to connect the cards. Written instructions are also possible. 6. The facilitator ends the session when the time is up or when the participants are satisfied with the results. 7. After the session has finished, the information will be documented, translated and used as input for WP 4.
Questions assisting the process **(as a print out on each table)**	• What are the land degradation issues in agriculture? (red cards) • Which land restoration practices do you apply or do you know of? (blue cards) • Which indicators exist to measure land degradation issues and performance of restoration practices? (white cards)
Output / Outcome	• One poster per group illustrating issues, restoration actions and potential indicators to assess these and relationships between different aspects. • A better understanding of the causal relationships underlying the problem situation.
Roles of participants	Groups can be assigned according to interests of participants. As with the rich picture, the focus of the exercise should be on the poster. Understanding

	and perspectives can be discussed, but the goal should always be to capture the findings on the poster. If participants are not willing or able to participate in this way, the facilitator should take up their verbal contribution and write this on their behalf.
Role of facilitators	• Encourage all participants to contribute ideas on issues, restoration actions and indicators. • Keep the time and end the session.

Step 2: Discussion of LanDS functionalities / requirements via 1-2-4-All method

Purpose	This method allows all participants to have their ideas heard and to collect many ideas at the same time while also consolidating them in the process. It prevents groupthink because it gives each participant the chance to first elaborate their own thoughts and then in stepwise discussions refine the initial ideas and enrich the pool of ideas within the group.
Preparation	• One room separate from the parallel group on issues, actions and indicators • Plenty of moderation cards for participants to write answers • Pens • Flipchart or poster attached to wall or pin board • Pins / tape / glue • Colour dots in three colours (practitioners, researchers, decision-makers) • One facilitator to moderate the session • Guiding questions for facilitator
Steps	1. Short introduction of the task. 2. Individual brainstorming in silence, notes can be taken. (2 min) 3. Discussion in team of two people. (3 min) 4. Discussion of two teams combined to a group of four people. (5 min) In this step, the group collects their most relevant ideas on moderation cards, one card per idea, the ideas should be readable from further away. 5. Discussion (10 min) The results are discussed in a plenary. The facilitator clusters the ideas on a pin board / poster / flipchart. 6. Ranking (10 min) The different ideas are rated, based on their value to different stakeholder groups. The guiding question for the ranking is: Who has an interest in which function? Stakeholders receive sticky points of the colour representing their stakeholder group (practitioners, researchers, decision-makers). The number of votes is calculated from the overall number of ideas: Approx. number of ideas / 3, rounding up -> no. of votes for each stakeholder

Questions assisting the process	Question for the 1-2-4-All discussion: • Do you think LanDS Dashboard purposes are relevant? • Which purposes would be interesting to you in addition to those presented? • Which functionalities do you expect of the LanDS Dashboard ? Question for ranking: • Who has an interest in which functionality?
Output / Outcome	• Pin board, poster or flipchart with different functionalities the tools can have that are identified as meaningful to the stakeholders. A ranking according to stakeholder groups gives an estimate of preferences and uses for different stakeholder groups. • A better understanding of the user needs and expectations.
Roles of participants	The focus of the exercise is to discuss and collect preferences for functionalities. Discussion is wished for and encouraged. The prominent ideas should be collected on moderation cards (at least in step 4. during the group discussion of four people).
Role of facilitators	Mediate the process: • Instruct the participants each time, they change arrangement of their discussion. • Timekeeping • Remind participants to write down the ideas on moderation cards visibly, one idea per moderation card during the group discussion. • In the plenary cluster the ideas in a suitable way on a pinboard, poster etc. • Explain the ranking scheme and distribute colour dots for each stakeholder group.
Further resources	https://www.liberatingstructures.com/1-1-2-4-all/

Exemplary results

The sessions have been carried out differently in the eight PAs. While in some PAs, a presentation has introduced the Land Degradation Decision Support Tool which has been followed up by stakeholder interviews, in other areas, an interactive session has been carried out. In the PAs Stornara and Tarra (IT) and Lower Gediz (TR), the first session has been carried out as described above. Figure 28 presents results for the Lower Gediz PA (provided by P. Tari Akap).

Low organic matter		Financial resistance of farmers		Training and dissemination should be reevaluate and apply sufficiently		Inadequate drainage systems(low performance)		Uncounscious and wrong irrigation applications		Erosion		Drought
I apply Compost, green manure, cattle manure		Social and economical support policies		Training on latest applications for farmers especially young and female farmers and NGOs.		Proper design of drainage systems		Irrigation systems should be design by scientific understanding		Mulching, green cover, nature-based solutions		Renovation investment of irrigation system
I apply permaculture		Input costs (TRY/year)				Improvement of drainage performance		Collective irrigation system project made by government				Enhancing of varieties resistant to high air temperature and drought
I am trying to apply less chemicals and regenerative agriculture		Farmers' net profit (TRY/year)						Supply (m^3) and demand(m^3) ratio on irrigation				
Amount of soil organic matter (mg/cm3)		Yield per da										

Figure 28: Summary of problems (red), known solutions (blue) and indicators (white) for one working group in the Lower Gediz PA in Turkey.

4.3 Target knowledge

After having discussed the problem understanding in each PA, it is important to create awareness for a potential and desirable future that is worth making the effort to change one's practices and structures (Willow 2022). Sustainability is a buzz-word lacking a precise and measurable operationalisation. Thus, in the ERLLs a contextualised, and yet, systemic understanding of interrelations between the economic, social and ecological dynamics and how stakeholders are embedded in these need to be established. This can be most effectively achieved by including stakeholders in the process itself. For this, the container "sustainability" needs to be filled with content that is meaningful to stakeholders in the pilot areas and addresses the different aspects of a definition of a sustainable livelihood perceived as relevant by stakeholders in each pilot area. Imaginations of a future state are a prerequisite for a just transformation, as they enable those people who will live in this future to take action instead of trying to steer the transformation from outside without contact with the actors in question. Therefore, we raise knowledge of the desired state, the target, towards which the actions need to work. Generating target knowledge is crucial to successful solution-oriented transdisciplinary research (Lang et al. 2012; Mitchell et al. 2015).

Within the second ERLL workshops, activities to create target knowledge comprised the envisioning of a positive future of agriculture (4.3.1). The visions developed in these sessions were assessed by the scientific project staff for the contained norms and values that build the basis of the stakeholders' understanding of sustainable agriculture. From these norms and values, indicators and metrics were derived (4.3.2). These were validated with the stakeholders in the ERLLs. In the third ERLL workshop, the restoration actions were assessed regarding their impact on social justice (4.3.3).

4.3.1 Envisioning positive future of agriculture in twenty years

First and foremost, visions are normative expressions of a desired future state (Young et al. 2023). The underlying norms depend on who is part of the vision building process and where the process takes place (Young et al. 2023). However, visioning has been shown to not only create an imagination of a future, but also to transform values and norms by engaging in this exercise (Young et al. 2023). Visioning exercises help actors to think beyond individual focuses and time horizons (Hebinck et al. 2018; Nalau und Cobb 2022) and are therefore suitable for fostering collaboration towards a common goal.

Once the desired state is known, it is possible to define actions to reach this state (Hebinck et al. 2018) and to build capacities for transformation. The visioning exercise may help actors to change their unsustainable practices, as they gain knowledge of the possibilities they have.

Casting and discussing community visions can lead to the creation of meaningful knowledge that can help identify relevant indicators that reflect the actual needs of the local community.

Engaging in visioning exercises encourages stakeholders to think systemically, moving beyond individual contexts to appreciate the interconnectedness of sustainability challenges (Young et al. 2023). This process helps to counterbalance the common and somewhat exclusive scientific rationale with forward-directed, creative thinking, fostering a more holistic approach to the ambition of sustainable development (Pereira et al. 2018). Furthermore, the development of visions enhances a community's capacity for anticipation and proactive responses to emerging challenges (Willow 2022).

In addition, in the ERLLs, envisioning exercises are employed as a preparatory tool for expert indicator selection. This approach serves several critical functions. First, it allows for the derivation of normative dimensions, elaborating the requirements for a sustainable future across their social, economic, and ecological dimensions. Second, it helps identifying gaps in awareness and concerns on both sides of the science-practice interface and fostering common understanding. By generating system knowledge on the analytical dimensions of the performance of specific agroecological practices, the visioning process provides contextually relevant insights that can inform indicator selection. Finally, including and empowering local communities in this process ensures that the selected indicators reflect their values and priorities, ultimately leading to more effective and meaningful assessments.

Through the exercises, criteria (a broad category or a general concern that represents public interests and scientific principles) that represent the values present in the project consortium as well as in each Pilot Area are defined.

The goals of the exercise can be summarised as follows:

- Definition of normative dimensions for assessment criteria for restoration actions (benefits and costs)
- Enabling reflection, learning and capacity building
- Enabling participants to see flexibility in the development of agriculture
- Create ownership to actively design the future through imagination
- Develop knowledge for identification of barriers and capacity development
- Comparison of differences and similarities regarding sustainability perceptions

Expectations towards participants of the visioning exercise:

- Realise what stakeholders wish agriculture in the region to look like in the future;
- Bring out stakeholders' ideas about a positive future of the agro-ecosystem and the human-environment interactions therein;
- Contribute to stakeholders' learning on visions and ideas of other participants on regional agriculture's and agro-ecosystem's future and their similarities and differences; and
- Develop a shared vision of sustainable agro-ecosystems in the Mediterranean by the REACT4MED consortium

Description of methods

Starting from the problem perception that was previously addressed with stakeholders (rich pictures), stakeholders are encouraged to think about a desirable future of agriculture in their region. This was done in five consecutive steps: (1) reflecting on who is taking part in creating the vision, (2) an imaginary journey into the future narrated by the moderator followed by individual visioning by each participant (3) creating a joint vision in break-out groups (4) presenting and reflecting on agreements and disagreements concerning vision elements across groups. In the following, each step will be presented in detail.

Step 1: Reflection on who is taking part in creating the vision: "Step into the circle if…"

Purpose	When building a vision of desirable future, it is important not only to reflect on whose underlying values are represented in the vision but also where there might be blind spots because certain groups are not involved in the creation of the vision. The goal of this exercise is to find out by which backgrounds the vision is influenced. It also aims at illuminating who is actually not present and whose values and needs are thus not necessarily represented in the vision.
Preparation and materials	The only thing required is space for the group to stand in a circle.
Steps	1. Participants and moderators stand in one circle 2. Moderator introduces the exercise: • The exercise will help us to reflect who is here to influence the vision that we are to develop and whose point of view cannot influence it. • If you feel addressed by a question, step into the circle. • Sensitive questions are not meant to marginalise but to reflect on the diversity that is inherent to this group. If a question makes you feel uncomfortable or exposed, you can choose not to answer. 3. Moderator asks questions (see below) and waits for people to step into the circle. • If someone steps into the circle the moderator may say: "We honour you." • If no one steps into the circle, the moderator should note this: "Our vision hence will be not represent …"

Questions	**"Step into the circle…"** …If you are younger than 25 …If you are older than 60 …If you are an immigrant or a member of your family's first generation in this country. …If you have children. …If you think that you belong to a minority in your country. *[One question referring to the basic level education such as:* *…If you completed primary school.* *…If you finished school when you were 13 years old.]* …If you work on a farm. …If you own the land that you work. …If you do not work in agriculture.
Output / Outcome	Awareness of the blind spots in the positive visions.
Role of participants	Reflecting on groups that are part of agriculture in the ERLL but are not represented in the exercise.
Role of facilitators	Creating a trustful and benevolent atmosphere, explain the purpose of the exercise in relation to the purpose of the vision.
Origin	Adapted from Stout, L., 2011. Collective visioning: how groups can work together for a just and sustainable future. Berrett-Koehler Publishers.

Step 2: Guided envisioning exercise: individual visioning

Purpose	Open the participant's mind for the visioning process.
Steps	**1. Individual visioning exercise** *Instruction: * - indication of a break between sentences, take as many slow breaths as many * are indicated. Hence, the more *, the longer the break.* *Read out the following narrative which takes about 7 minutes:* We are now doing a short introductory exercise for the elaboration of the visions. You can close your eyes during the next few minutes if you wish. In any case, it is important that you calm down and get involved with the words. If images don't appear immediately in front of your inner eye, then that's fine. Do not put yourself under pressure. Just perceive what is going on inside you. You may see very concrete pictures; you may not see anything at all. Maybe you feel more rather than see. Just get involved in your positive vision of agriculture in [ERLL region] in 2043.

	Think of what you wish for and be creative. For instance, you can think about a place in the countryside that is very familiar to you in [ERLL region]. This will ease the process of imagining. Ask yourself the question: "**How would [ERLL region] look like, if it looked as you really want it to be?"** Make yourselves comfortable. Again, if you like, you may close your eyes for a few moments to mentally step into this future. Take a deep breath: breath in and breath out.*** Imagine that we're travelling through time. We are travelling 20 years into the future. The year is 2043 years. In this future we are adapting successfully to a changed climate. *** You had a good night's sleep and you wake up relaxed and recovered. You look outside the window, it is your preferred weather. This suits you well, as today, you have a free day and you plan to go on a trip through [ERLL region]. *** You want to have a thorough look around because later today, you will discuss the current state of agriculture in [ERLL region] at a workshop together with many other people, some of whom you got to know in the REACT4MED project 20 years ago. * On your visit, you go to some farms and different places in [ERLL region]. You notice how many positive things have been achieved in [ERLL region] in the past 20 years. *** How does the area look like to you? *** You walk along some agricultural fields. What do you notice about the fields? * Which crops are growing? *** [*Optional if it applies to you ERLL:* Which role does animal husbandry play? ***] How is the water used on the farms? How are the fields irrigated? *** Which practices do you see to work the soil **, to plant **, to harvest? *** And who do you see? ** Who works on the farms? ** What do people do?*** You regard the landscape. You take your time to notice in detail the plants **, the soil **, the arrangement of fields in the landscape **, the combination of natural and planted elements. Which wild animals, which plants do you see in the nature? *** How does it smell? *** Which agricultural products does [ERLL region] produce? ** How are they marketed? *** And who consumes them? *** How do people live in [ERLL region] in year 2043? *** How does it feel to be [ERLL region] in the year 2043? *** Take a few deep breaths to find yourselves back in the present. You may now open your eyes again. **2. Collecting key aspects of individual visions**

	Engage the participants to note down elements of their individual visions. Give them 3 min for this exercise: Take a moment to think about and note down those aspects that you deem most important. This time travel serves as an inspiration for the visions that we will create in small groups in the following. Remember: **How would this area look like, if it looked as you really want it to be?**
Outcome	• Individual expression of what participants want to see in the future.
Role of participants	• Keep an open mind. • Engage in the activity.
Role of facilitators	• Guide participants through the process. • Help to maintain a comfortable and trustful atmosphere.

Step 3: Group visioning exercise

Purpose	• Create and discuss desirable common visions of agriculture in the ERLL in the future. • Better understand what aspects matter to the stakeholders (the values that let them judge whether a development is positive or negative) • Create an understanding among stakeholders, that over time circumstances can change • Create ownership to actively design the future through imagination
Preparation and materials	• Big sheets of paper as posters to collect the vision elements for each group • Pens • Guiding questions for facilitators (one facilitator for max. 6 people) • In order to develop a vision narrative rich in details, it might be helpful to have a person taking the minutes of the discussion.
Steps	1. **Building groups** Build groups of max 6 people per moderator. Build preferably heterogeneous groups. 2. **Rules of the group work:** • We are appreciative towards others • Only one person talks at a time • We work with consent: we accept points of others if there is no significant objection. 3. **Collection of key elements of the vision** The moderator asks every participant, which are their 5 key elements. *Advice: The moderator can either write down the different elements on moderation cards (easier to cluster later) or write them down on the big paper (preferably already loosely related to the different categories below).* 4. **Clustering of key elements**

	Either: Group the key elements according to different dimensions, such as: • Community • Agriculture • Markets • Environment • Education and science • Technology and infrastructure • Regulation and policies *Or:* Group the key elements according to arising groups *Advice: If the elements are written on moderation cards, the clustering can take place after all elements are collected. At the end, the moderation cards should then be fixed on the paper. When writing down the elements on the big paper directly, it is useful to sort them under the categories above from the beginning, as moving them is not possible afterwards.* 5. **Collecting details of the vision:** Ask the group, what exactly they want to see in the future. Ask for every key element, what it means to them. Aim for further detail so that the key elements become sufficiently clear to everyone. 6. **Addition of elements:** Ask the group, what they want to add to these elements 7. **Preparing a presentation:** 15 min for the groups to prepare their own presentation of their vision (picture, flip chart…)
Questions	The vision that is developed should answer the following questions: • How would you like agriculture to be in the [ERLL region] in 2043? • Which needs will the agricultural system meet in [ERLL region]? • How will the rural areas look like in 2043? • What are major differences to today's agriculture? You can think of how agriculture in [ERLL] is related to the community, agriculture, markets, environment, education and science, technology and infrastructure, regulation and policies

Output / Outcome	• Per group an overview of how a desirable, sustainable agriculture could look like in the ERLL in the future:
	  ○ Per group, a vision described by key elements and details understandable to outsiders
	  ○ Per group, a narrative that sets the key elements in context and gives more details on them
	• All vision elements collected and translated

Role of participants	• Contribute their imagination and underlying values of what makes up a desirable agriculture in the ERLL
Role of facilitators	• Help to maintain a comfortable atmosphere • Guide the envisioning process by questions about different elements of the vision when stakeholders get stuck

	• Remind participants to think not only of agriculture itself but also its contexts and interactions with other areas, such as the environment and local communities • Encourage participants to voice their opinion

Step 4: Plenary discussion of visions and reflection on disagreements on vision elements

Purpose	The purpose of this session is to clarify and consolidate information from visions and to understand the agreements and objections by participants
Preparation	• The posters of the vision • Sticky points in two colours • Pin walls or something else to put up the posters in order to discuss them in the plenary
Steps	1. **Group presentations as gallery walk:** • Vision posters are put up visibly in the room • Participants walk from poster to poster (either left on the tables or attached to a pinboard), the respective group presents its vision 2. **Collecting agreement and disagreement:** • After all posters are presented, participants walk and revisit the visions of the other groups • The participants are asked to highlight which elements they find most important in the visions of other groups. They are invited to indicate these with sticky points in a certain colour of which they receive 5 points in the beginning of the session. • With a sticky point of another colour that are available at each poster they can indicate their objection with something stated in the poster. 3. **Highlighting disagreement:** The moderator highlights points of disagreement. Participants are asked to clarify their concerns if they like. A minute taker should collect these voiced concerns. 4. **Highlighting agreement:** The elements that participants seem to perceive as most important elements are highlighted by the moderators.
Output / Outcome	• Posters with highlighted agreements and disagreements in original language and digitalised versions translated to English. • Written description (a narrative) of the vision translated to English. People that have not participated in the workshop should be able to understand the vision. • Minutes of the discussion regarding the concerns raised by participants.
Roles of participants	• Presentation of groups' visions.

	• Contributing their views on the visions of other groups to highlight differences and commonalities.
Role of facilitators	• Highlight the agreements and disagreements between visions based on the sticky points that participants allocated to the posters. • Encourage all participants to contribute their views on the disagreements regarding the groups' visions. • Keep the time and end the session.

Exemplary results

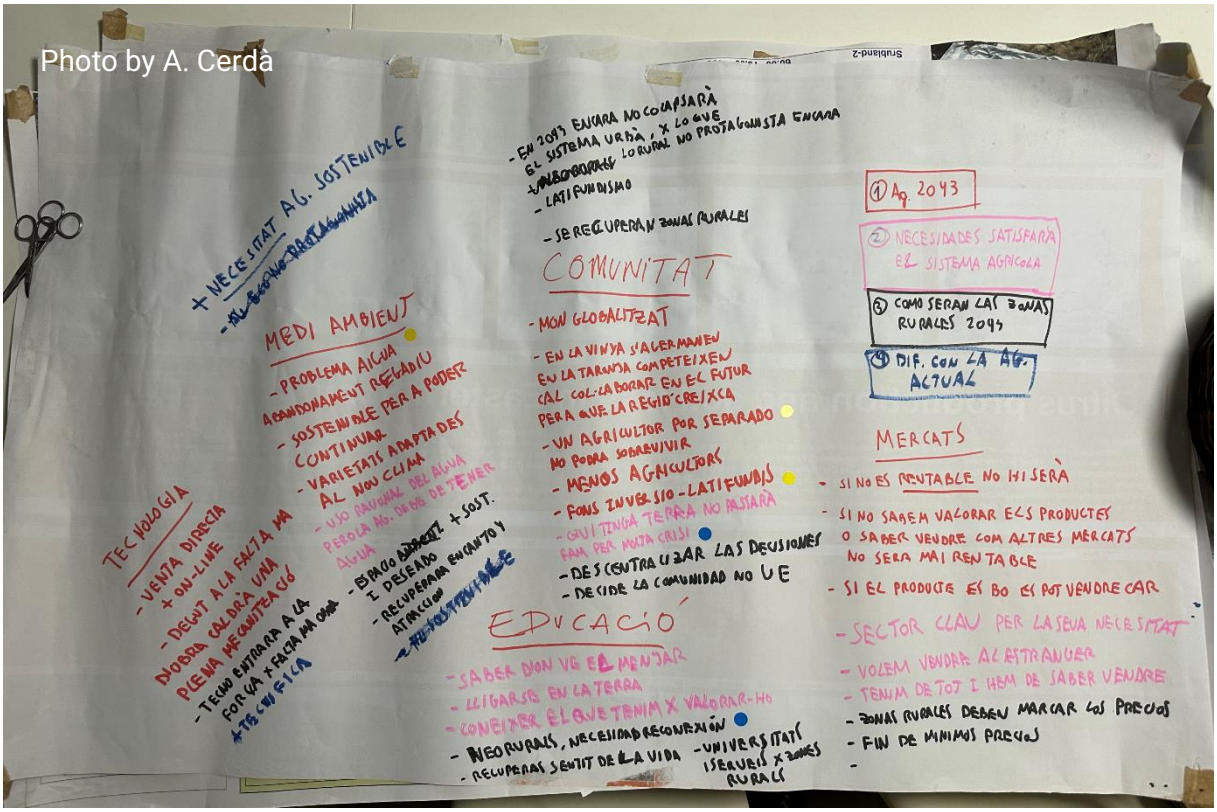

Figure 29: One vision of the ERLL Canyoles river in Spain.

Visions were created in six of the eight pilot areas. For Morocco and Israel, no visions were developed. As stakeholders in Morocco went through a visioning process when developing the aim to widely implement Conservation Agriculture, the PA team considered this exercise for their ERLL irrelevant. Due to the outbreak of the war in Israel, the PA team considered that visioning a positive future was not feasible for stakeholder in these times. In the other pilot areas, at least two visions were created by different groups. Although it was reported that many participants enjoyed creating a positive vision, some participants, especially older ones, found it very difficult. In fact, in the ERLL in Spain it required a lot of the moderators' efforts to convince participants to think about potential positive changes in the future and to constructing a convincing positive vision. Instead, participants tended to circle back to doubts and fears about the future. Here was one conclusion, that participants were not used to looking ahead and thinking about alternative and also more beneficial pathways of the future. This was also perceived as an opportunity to help stakeholders achieve a more constructive approach to uncertainties and also their own agency. Another suggestion was to rather

conduct one-on-one interviews, since some participants did not seem comfortable expressing their vision in a group.

The elements of the visions in each pilot area were context-specific. Also, the scale of the visions that were created varied in each pilot area. Some visions were focussing more on the agricultural context facilitating certain agricultural activities like in Canyoles (Spain) and Heraklion (Greece), others were more holistic, encompassing different aspects of a sustainable society in the region like for the Troodos Mountains (Cyprus) and Stornara and Tara (Italy). However, many similarities could be observed. Most visions required changes in many fields and on different scales, concerning agricultural practice, administration, policy, trade and demand.

Of special importance across pilot areas were the profitability of farming practices and the capacities (also financial and time) of farmers to experiment, learn and adapt. Also, participants in several PAs promulgated shorter supply chains and closer consumer-producer connection as well as a more equitable share of profits. Many saw cooperatives as a promising organisational unit to share costs and profits equally. Across pilot areas participants agreed that the future would be technology assisted allowing for efficient use of all resources. As for the overarching paradigm, many participants would like to see a society which is connected to and embedded in natural process instead of being a burden to the environment.

In the following table, visions of each pilot area will be briefly summarised (Table 3).

Table 3: Overview of vision elements per pilot area.

Pilot area	agricultural / economic	social	environmental
Cànyoles river basin, Spain	sustainable agriculture high quality products cover costs and make a profit recognition of value of farming adaption to climate change technical advice guaranteed work conditions farmers as stewards of the land producer connected to land, equal benefits for big and small producers rural revitalisation pay for ecological services cooperatives and partnerships new online markets	reduced bureaucracy awareness in society quality of life technology for resource efficiency regulation for long term orientation information and capacity building for professionalisation and learning Tourism, environment and agriculture are fully integrated: tourism, recreation and food production benefit from another regional governance hiring migrants	stewardship of land and ecosystems reconnection to nature

	diverse markets: mixture of efficient production and artisanal products		
Heraklion, Greece	attractive for young people diversification of agriculture well established and distributed training system, farmers are highly qualified, native and adapted species, local production and consumption, short supply chains coordination of trade for match of consumption and production cooperatives and partnerships high quality goods	technology for resource efficiency, reduced meet consumption enforcement of regulations Decentralised infrastructures and production Tourism, environment and agriculture are fully integrated: tourism, recreation and food production benefit from another	stewardship of land and ecosystems land use regulations are enforced nature-based solutions infrastructures for water collection
Lower Gediz river basin, Turkey	highly qualified farmers and engineers clean food production, attractive for young farmers integrated large-scale farming, small farms for self-sufficiency, organic agriculture, adapted to climate change, hands-on education in agriculture, diverse and efficient agriculture, rural revitalisation urbanisation, Short supply chains: no intermediaries cover costs and make a profit, high-value products cooperatives and partnerships marketing collectively, stability of income	social equity intergenerational learning clean food consumption awareness and NGOs on clean food technology for resource efficiency, basin-based production planning water use is regulated and functioning, water protected in quality and quantity regulation for long term orientation	soil health, water use efficiency clean environment and healthy ecosystems (agro-)biodiversity nature based solutions reduction of fossil fuels renewable energy

	state and insurance support experimentation and research circular economy		
Stornara and Tarra, Italy	strong connection between products and identity: trademark certification professionalisation of past agricultural heritage Rural-urban connectivity: Short supply chains, citizens engage in food production	Territory oriented Tourism, environment and agriculture are fully integrated: tourism, recreation and food production benefit from another, technology for resource efficiency, Engaged local community, regional development strategy: information and capacity building for professionalisation cooperatives provide stability and orientation	Rich agro-biodiversity No use of fossil fuels Adapted crops Need-based water provision, Use of alternative water sources
Tamia, Egypt	high quality farming inputs (seeds, resistant varieties), crop diversity, accessibility of all farming inputs, crop diversity, accessible fertilisers, reduction of chemical fertilisers, biological fertilisers, natural disease and pest control, modernisation and mechanisation of agriculture and irrigation, increased productivity, high quality products, prosperity attractive for young farmers, diverse markets, easy access to products, new business opportunities and supply chains,	accessible technology for resource efficiency, equal education opportunities,	safe waste water treatment, water abundance, good water quality, reduction of environmental pollution

Troodos Mountains, Cyprus	sustainable agriculture organic farming prevalent soil health rural revitalisation attractive for young farmers distinct brand: identity of local mountain heritage high-value products Rural-urban connectivity: Short supply chains, regional cooperatives and partnerships hub for education, experimentation and research knowledge infrastructure for innovation and professionalisation	benefits are shared across community Tourism, environment and agriculture are fully integrated, technology for resource efficiency, regional governance reducing abandoned land	stewardship of land and ecosystems circular economy biodiversity renewable energy

4.3.2 Indicators and Metrics: Selection and validation

Many indicators and assessment frameworks already exist. A common challenge of participatory sustainability assessments is that the number and quality of indicators generated by participatory techniques largely depend on how local stakeholders (and the researchers) perceive sustainability and how well they understand the socio-ecological system dynamics and their role within them (Vaidya & Meyer, 2014).

Finding an appropriate structure and approach to account for the needs of stakeholders is of special relevance to the ERLL approach. Particularly, the approach must be accessible to non-scientists and relatable to their living realities. Furthermore, it needs to be assured that all dimensions of sustainability are represented.

Description of methods

A stepwise process to derive place-based as well as global metrics to assess the suitability and performance of a restoration action has been designed. Starting with contextualised visions for each PA, first the most dominant elements and from these values and criteria have been identified. Shared visions of a desirable future illustrate place-based values that can inform the normative frame for the sustainability assessment. Shared visions can also highlight different understandings of sustainability in different ERLLs.

From these visions, suitable criteria can be derived, refined and validated with the stakeholders in an additional step. For this, formats such as surveys and expert groups are suitable to address concrete questions about specific indicators.

Since the project wants to contribute to restoring ecosystems and reducing land degradation, stakeholders need to be taken along to a more systemic perception of the problem and opportunities for change. This will not only contribute to assessing the restoration actions as such but will already prepare the way to identify barriers and opportunities and offer capacity building. Both of which are a task of the ERLLs.

Step 1: Coding

After having captured the discussions in a narrative that combines and adds details to the key elements, the narratives were coded to identify the underlying values, criteria or even subsequent indicators. We understand values as reference points for evaluating something as desirable. The underlying values in the vision give a normative direction and serve as a long-term orientation(Schneider et al. 2019b). Criteria are broad categories or general concerns expressed in a value and indicators represent specific properties of a certain criterion in a quantitative or qualitative variable (Vaidya und Mayer 2014). The coding in terms of values, criteria and indicators was conducted for all narratives with Atlas.ti, a software tool for qualitative data analysis.

After all narratives are coded, the identified vision elements are allocated to one of the three categories: values, criteria and indicators. Criteria and indicators are subordinated to values. Relations between values are established and linked to criteria and potential indicators. The combination of values, criteria and indicators gives an impression of those aspects that are important to the participants.

Step 2: Expert selection

Each PAL received the list of criteria that were expressed in their living lab visions. From this list, they selected criteria and indicators they estimated to assess the respective restoration practice. If other important criteria and indicators were deemed lacking by the researchers, these were added to the list.

Step 3: Validation

To understand whether the pre-selected indicators are useful to those stakeholders that will apply them in their assessments, focus group discussions should be conducted.

Focus group discussions are a directed discussion for the purpose of gaining information of a particular set of the population. For the validation of indicators, we suggest a homogeneous composition of focus groups in order to avoid discussion of basis topics.

The following focus groups were suggested:

- Farm level: Extension workers, farmers associations, NGOs, research and education
- Regional and societal level: administration, policy makers, NGOs, research and education

Process of focus group discussions:

  - Explain the previous selection process.
  - Discuss the list of indicators (only those that were selected in step 1, column K) with the participants along the following questions:

Indicator validation

1. Which of these indicators or proxy indicators do you use or find useful to assess the performance of the restoration action?
2. Are there any additional indicators or proxy indicators that you find important (other than stated in Columns C and D?)
3. **Indicator prioritisation:** Concerning the performance of the restoration practice, which indicators/criteria would you find very important?

Each participant receives sticky dots. The number of sticky dots depends on the number of proposed indicators. The number of sticky dots that every participant receives should range between 0.2 or 0.8 times the number of indicators in the list. If you have many indicators, choose a smaller percentage. If you have fewer indicators, choose a higher percentage. The participants should stick the dots on those indicators that they find very important. They may bundle their dots at those indicators that they would like to emphasise.

- If you deem this important: You proceed with the prioritised list by asking the following:
    4. What are possible data sources?

Exemplary results

All visions that were created by stakeholders throughout the visioning workshops were inductively coded and nine different dimensions were formed: rural revitalisation, agricultural sustainability, healthy soils, ecological sustainability, sustainable use of resources, social sustainability, good governance, coordination and cooperation, stability and predictability (Figure 30).

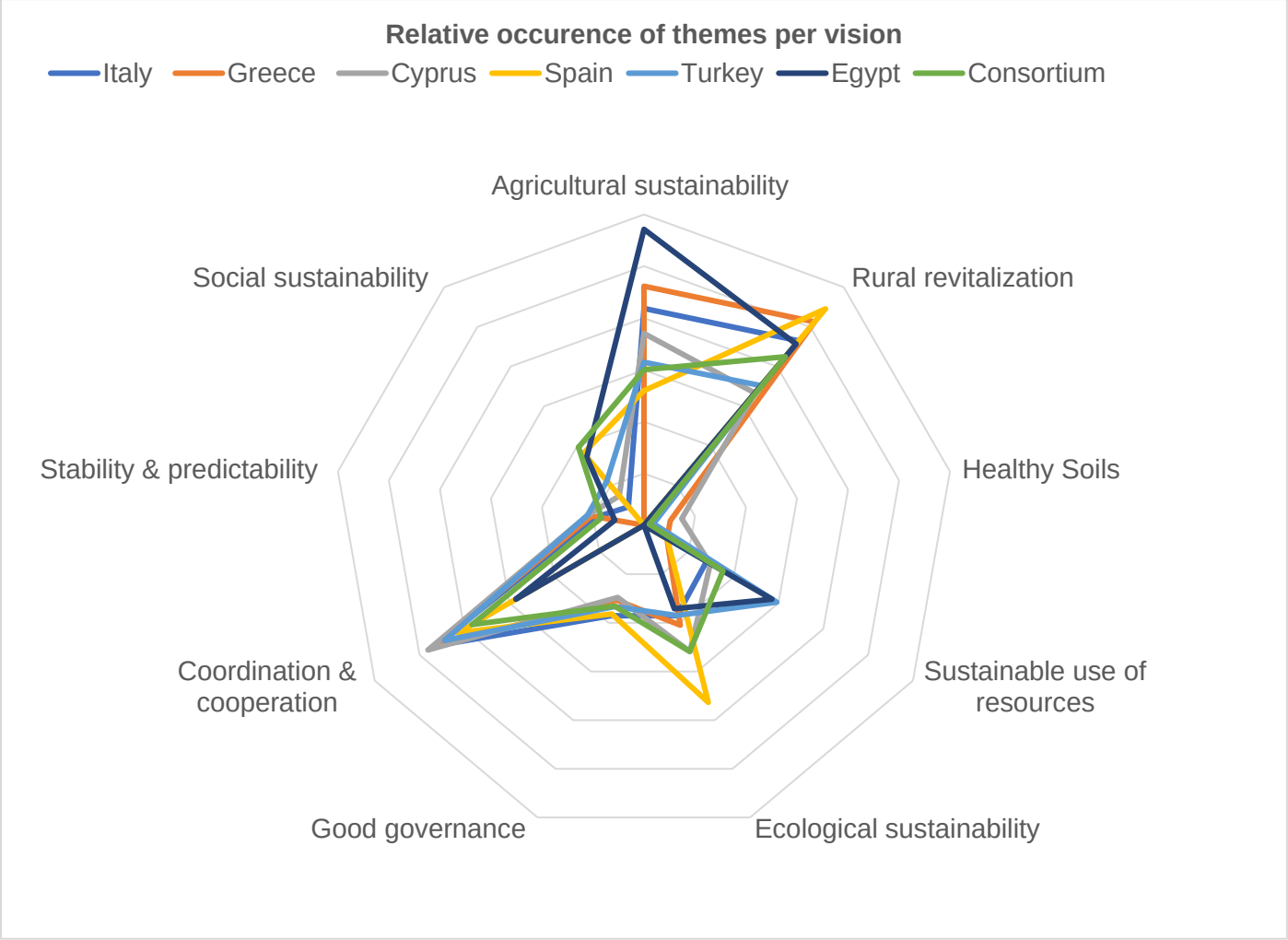

Figure 30: Relative occurrence of vision elements in nine inductively defined value dimensions.

While all dimensions of sustainability were encompassed in all visions, it became clear that the economic and social dimension were mentioned more often by the stakeholders throughout the pilot areas (Figure 31). This already shows, that concerns of stakeholders regarding a positive future are more related to socio-economic topics. While intact ecosystems, healthy soils and clean water build a basis for this, these elements are less often explicitly addressed in the visions. This offers an interesting point for reflection, emphasising the need to elicit the direct link between intact ecosystems and good livelihoods.

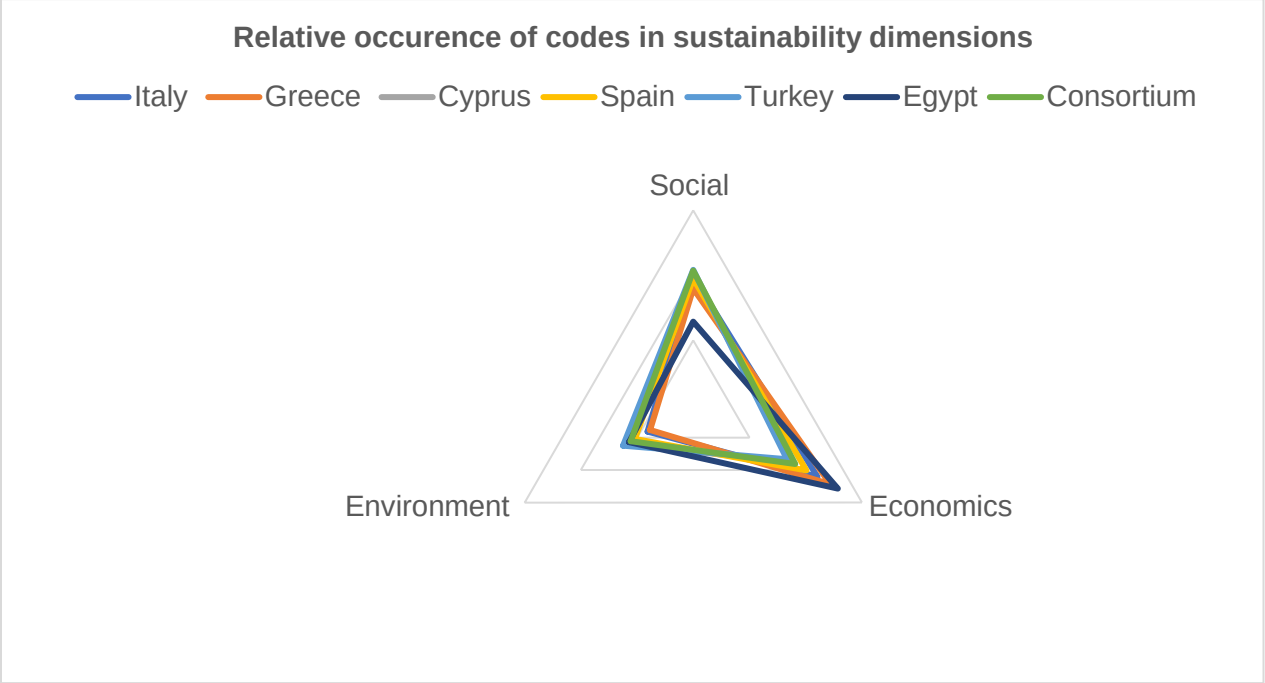

Figure 31: Vision elements sorted according to their sustainability dimension: environment, economy and society.

Presentation and discussion of initial indicators in Stornara and Tara (Italy)

In the case of the Italian ERLL, the indicator validation was done together with stakeholders as part of the third ERLL workshop. During the first phase of the validation, a discussion with stakeholders allowed to collect their opinion about the validity of the proposed list of indicators. Table 4 displays the initial list of selected indicators that was presented to participants of the validation process.

Table 4: Selection of indicators relevant for the Italian pilot area (Stornara and Tara) based on information from the visioning exercise.

Coordination and cooperation		Community managed assets	Partial data on infrastructures and/or technologies such as irrigation water provision	High
		Network density of social relations	Platforms for farmers associations and water managers	Medium
		Knowledge sharing and cooperation among farmers	Partnerships and cooperation	Medium
	Flood risk management		Flooding (frequency <5 yrs, >5yrs)	>5yrs
	Integration of land uses		Agritourism	High density
	Integration of land uses		Land abandonment	Low

	Integration of land uses		Multifunctionality of agricultural land	
		Science for practice	Appropriate irrigation strategies present	High
		Scientific knowledge accessible	Science-practice exchange and consultation	Medium
		Technical knowledge present	Consultation services present	Medium
		Resource efficiency enhanced through technology	Smart farming; Automation; AI; Digitalisation; Data monitoring;	High
Biodiversity in nature	Structural diversity		Physical arrangement of biotic components within ecosystems	Low
Climate change adaptation and mitigation	Carbon sequestration carbon sinks		Potential for carbon sequestration	Medium
Connection between people and planet		Environmental awareness of society	People are aware of water, soil, and environment	Medium
		Presence of NGOs	Availability of NGOs creating environmental awareness	Low
	Stewardship of land & environment		Farmers are supported to be stewards of the land; benefits from maintaining the landscape and ecosystem services;	High
Ecosystem services	Decomposition of SOM in soil		SOM mineralisation	High
	Provision of ecosystem services		Services provided	High
	Water storage in soil		Water storage capacity; soil water retention	High
Education for sustainable development		Recognition of value of farming	Public dissemination of agriculture benefits	High
Nature conservation		Landscape conservation	Integrity of traditional landscapes; cultivation of traditional crops,	High

Policy instruments		Support to innovative/ sustainable farming	Institutional (regulatory) and economics barriers or support to innovation farming techniques and change	Medium
		Polluter pays principle implemented		Low
		Support for smallholders	Adaption of market demands for smallholders	High
Supportive institutional framework		Regulated trade	Reduce reliance on imported food products; stimulate regional trade	High
Biological properties	Microbial carbon availability		Needs measurements	High
	Microbial Nitrogen availability		Needs measurements	High
	Organic matter decay		Needs measurements	High
	Organic matter turnover		Needs measurements	High
	Root density		Needs measurements	High
	Soil biodiversity		Needs measurements	High
	Soil microbial diversity		Needs measurements	High
Chemical properties	Cation exchange capacity		Needs measurements	High
	Crop yields and available soil P contents in agricultural soils		Needs measurements	High
	pH, EC, NO3 and metal concentration		Chemical elements related to fertilisation stress and soil pollution	High
	Soil organic matter (SOM)		Soil erosion and degradation index	High
	Soil organic carbon (SOC)		Soil erosion and degradation index	High
	Soil salinity (<4dS/m, > 4dS/m)		Measure of minerals and salts that can be dissolved in water (often > 4dS/m	High

	Soil sodicity		Needs measurements	High
Physical properties	Field capacity, wilting point		Needs measurements	High
	Infiltration rate		Needs measurements	High
	Soil bulk density		Needs measurements	High
	Soil texture		Needs measurements	High
	Stone content		Needs measurements	High
	Water storage capacity		Needs measurements	High
Land degradation	Land degradation status		Overall assessment of the Degradation status in the pilot area (L, M, H).	Medium
	C/N ratio		Soil erosion and degradation index representing the ratio of the mass of carbon to the mass of nitrogen in organic residues	Medium
	Soil erosion intensity (L, M, H)			Low
	Trend of % soil sealed			Low
Attractiveness of farming		No. of youth and women engaged in farming (% of workforce)	Level of engagement of young people and women in farming	Low
		Sufficient labour present		Low
		Income diversification	Diverse forms of income; combination e. g. with agritourism;	Medium
		Ownership of agricultural land	Land tenure; access rights to agricultural lands	High
Economics		Acceptability of restoration practice		High
		Accessibility of technologies	Affordable and accessible; accessible to smallholders and local farmers	Medium
		Affordability of restoration practice	Applying best practice is financially profitable	Medium

		Feasibility of restoration practice		Medium
		Farming as main occupation	Reliance on income (single source)	High
		Income level (EUR/day)		High
		Marketability / competitive advantage	Emergence of new markets; added-value production;	Low
		Technical readiness of restoration practice		Medium
Sustainable use of water resources	Amount/share of water reused		Needs measurements	High
	Area of drip irrigation		More than 50 ha	High
	Performance of drainage system			Medium
	Environmental (water) flows			High
	Groundwater contamination risk (L, M, H)			Medium
	Groundwater quantity			Low
	Groundwater recharge			Low
	Rainfall intensity			High
	Use of alternative water sources		Water stored in reservoirs; water harvesting	High
	Water availability		Scarcity of water	High
	Water quality			High
	Performance of water supply system			High
	Irrigation water supply costs		Annual cost of water supply per cultivated area	High
	Water irrigation/ management efficiency		Rate of irrigation water use efficiency for the different implemented irrigation systems	High
	Water supply / demand ratio of irrigation		Water supply exceeds water demand (No it is the opposite)	High

	Water use efficiency			High

What was the stakeholder feedback to the pre-selected indicators?

Not all stakeholders were familiar with the concept of indicators. In fact, part of the session was dedicated to introduce and explain the process behind the identification of the set of indicators. Once all stakeholders became familiar with it, we left them discussing about the adequacy of the proposed indicators and also the completeness. At the end of the session, some stakeholders proposed to integrate the list with new indicators that from their point of view and based on their knowledge were important. After a fruitful exchange of ideas, stakeholders agreed on the list, and advanced a proposal to integrate the list with the following indicators per each criteria:

Criteria for selection	Indicators
Coordination and cooperation	n. of warning messages generated by the Civil Protection divided by risk (Flood, Landslides, Hydrogeological... but also Wind and Snow)
Climate change adaptation and mitigation	Analysis of Extreme events: a) rainy days with maximum intensity; b) consecutive rainy days; c) heat waves; d) number of consecutive days with temperatures above 35°
Education for sustainable development	climate risk and vulnerability assessment to ensure that is proportionate to the scope of the activity and to the expected duration

With this approach (from visions to indicators) did you choose different indicators than you else would have chosen?

Passing from the vision to indicators forced us to explore a wide range of indicators. In our opinion the list is exhaustive and complete thanks to this approach so it contains all indicators we would have chosen even using a different approach.

How do you think this approach worked?

The approach worked well even if at the beginning it has not been easy to pass from the vision to the indicators forcing us to elaborate and interpret our results in a different way.

4.3.3 Social justice enquiry

Complementary to the identification of indicators from the visions, the social justice enquiry supports participants to consider the costs and benefits of implementing the restoration actions and to reflect on the implications of social justice.

Aim

- Collection of data on environmental and socio-economic costs, benefits, opportunities and other consequences

Description of methods

Purpose	Assessing the impact of the restoration actions on social justice
Preparation and materials	• Presentation in the plenary of the Power point slides: Social justice enquiry • Material: Large poster (A0 or 2 A0s) per break out group (see template below), large pens, large sticky notes • Preparation: Small, heterogeneous groups are formed (max. 6 people).
Steps	The enquiry contains two steps: (1) the identification of costs and benefits of the restoration action, relative to a baseline (e.g., similar field/practice/crop without restoration action), and how these costs and benefits are distributed across actor groups (Implementing farmer/land owner, Other farmers, General public, Government (support)) (2) reflection on how benefits/ costs are distributed across actor groups and what effect this has on the community. **1. <u>Identification of costs and benefits and how they are distributed</u>** The facilitator explains the matrix again. Definitions: • On-site: the area to which the restoration action is applied. • Off-site: areas that are adjacent or further away. • Costs and benefits are not necessarily financial, they can also be positive and negative impacts such as direct access to certain products, employment or improved soil health. The facilitator hands out pens and sticky notes to the participants. Alternative: If your participants are hesitant to write, the note taker will instead write down their answers. The participants take turn in explaining and writing down costs and benefits (no quantifications needed) and assign them to the respective costs/benefits categories as well as the respective actor groups. If there are specific sub-groups of the four main actor groups this should be specified on the post-it (e.g., small farmers don't get subsidies, local authorities need to improve the road network, national government pays the subsidies) For off-site effects there is no limitation to how far the participants think the effects will reach. It is okay, if boxes in the matrix remain empty while some benefits are mentioned for all actors. **2. <u>Reflection on the distribution of costs and benefits</u>** • The facilitator encourages the group to reflect on the distribution of costs and benefits in the community:

- "Looking at the distribution of who pays and who benefits. In your opinion, how will this distribution affect the community/the society as a whole?"
- "To what extent and in what way does the restoration action reduce or strengthen existing social (in)equalities?"

The facilitator takes notes of the answers on a flipchart.

Additional information:

For step (1) of this exercise, it is crucial to think further than the directly felt aspects. A helpful list of possible costs/benefits are listed in the PDF "Attachment_SLM Technologies_Impacts" (Source: WOCAT questionnaire).

For structured guidance, the facilitator can use the following structured prompts:

On-site and off-site costs

- Facilitator asks the group: "Which costs are involved with implementing the restoration action and who bears them?"
- The facilitator enquires, depending on which answers have been given already: "What about
  - Infrastructure & equipment?"
  - staff costs?"
  - maintenance and repairs?"
  - relevant economic costs (e.g., decreased production, decreased product quality, production area)?"
  - relevant environmental costs (e.g., increased water consumption, soil degradation, soil sealing, flood risk)?"
  - relevant social costs (e.g., exclusion of a particular population group, reduced food security, need for better educated personnel)?"

On-site and off-site benefits

- Facilitator asks the group: "Which benefits does the restoration action have and who benefits?"
  The answers of participants are collected and noted.
- The facilitator enquires, depending on which answers have been given already: "What about
  - relevant economic benefits (e.g., increased production, increased product quality, product diversity)?"
  - relevant environmental benefits (e.g., increased biodiversity, improved soil quality, improved water storage, adaptation to climate extremes)?"
  - relevant social benefits (e.g., diversification of economic activities, conflict mitigation, higher inclusivity for young people in agriculture)?"

  The answers in response to the facilitator's enquiry are collected and noted on the poster.

Outcome	**1. Identification and distribution of costs and benefits** • An assessment of the distribution of costs and benefit categories based on participants' views. • An indication for how the restoration action affects the participants who are present. **2. Reflections** • Minutes on the discussion of the distribution of benefits and costs for the community/the society as a whole and its effects
Roles of participants	Reflect on the impact of the restoration action and contribute their personal views on relevant costs and benefits.
Role of facilitators	Guide the process with structure and questions, so that the different categories are covered. Learn about what participants have in mind.

Template for the social justice enquiry

Main actor groups / Costs and benefits	**Implementing farmer/land owner**	**Other farmers**	**General public**	**Government (support)**
On-site benefits/costs				
Environmental benefits				
Social benefits				
Financial benefits				
Neg. environmental effects				
Negative social effects				
Financial costs				
Off-site benefits/costs				
Environmental benefits				
Social benefits				
Financial benefits				
Neg. environmental effects				
Negative social effects				
Financial costs				

Exemplary results

On-Site Costs and Benefits of Mountain Terraces (both traditional and modern/mechanised terracing systems) in the Troodos Mountains, Cyprus (provided by C. Zoumides):

Costs and Benefits	Implementing Farmer/Landowner	Other Farmers	General Public	Government (Support)
Environmental Benefits	Improved soil quality, water retention	Indirect benefits through knowledge sharing	Better water management and reduced erosion	Progress towards national soil conservation targets
Social Benefits	Job creation during construction	Potential training opportunities	Agrotourism potential and improved landscapes/biodiversity	Support for rural revitalisation initiatives
Financial Benefits	Increased productivity and resilience	Future adoption opportunities	Access to higher-quality local produce	Long-term reduction in restoration costs
Negative Environmental Effects	Soil compaction and habitat disturbance; soil erosion if not constructed/maintained properly	Minimal impact	Habitat loss in affected areas	Monitoring and compliance costs
Negative Social Effects	High costs limit adoption by small farmers	Inequities in access	Disruption during construction	Strain on equitable resource allocation
Financial Costs	High implementation and maintenance costs	Minimal direct impact	Indirect financial burdens (e.g., infrastructure)	Subsidy requirements

Off-Site Costs and Benefits of Mountain Terraces (both traditional and modern/mechanised terracing systems) in the Troodos Mountains, Cyprus (provided by C. Zoumides):

Costs and Benefits	Implementing Farmer/Landowner	Other Farmers	General Public	Government (Support)
Environmental Benefits	Reduced sediment flow and improved irrigation	Improved regional soil and water quality	Enhanced ecosystem health and biodiversity	Contributions to international environmental targets
Social Benefits	Community integration	Regional collaboration	Tourism potential and aesthetic appeal	Strengthened rural policies and programmes
Financial Benefits	Market expansion for high-quality products	Supply chain development	Economic uplift through agrotourism	Stabilised rural economies

Negative Environmental Effects	Erosion during construction, emissions (inc. dust) and noise	Minimal impact	Temporary pollution in adjacent areas	Oversight for unintended impacts
Negative Social Effects	Minimal direct impact	Minimal direct impact	Altered traditional landscape aesthetics	Balancing development with heritage
Financial Costs	Transportation and logistics costs	Minimal direct impact	Public resource allocation	High funding needs for support programmes

4.4 Transformational knowledge

Once the problem and the aim were defined, transformation requires knowledge on strategies—whether technical, social, legal, cultural, or otherwise—that seek to alter the current practices and promote preferred ones. This was achieved with the backcasting from a desirable future (4.4.1).

4.4.1 Out- and upscaling - Backcasting from a desirable future

After the direction of the desired change has been decided upon, the next step is to select measures that can facilitate this change. Backcasting is a method that is especially useful when dealing with persistent and complex challenges that require long-term system transformation (Quist et al. 2013). Vergragt and Quist (2011) define it as "generating a desirable future, and then looking backwards from that future to the present in order to strategise and to plan how it could be achieved" (p. 747). “Looking back” from the future, the approach allows stakeholders to reflect on important changes (milestones) that were necessary to come closer to the desired future. Starting with these necessary changes, actions and actors are identified and barriers and opportunities are discussed. This is done looking at different societal sectors (agriculture, society, economy, markets, policies) while identifying requirements such as new knowledge and technologies, novel actor constellations, etc. (Quist and Leising 2016). By doing so, participants will create a map of steps (actions) and actors required in the short-, medium- and long-term (Figure 32).

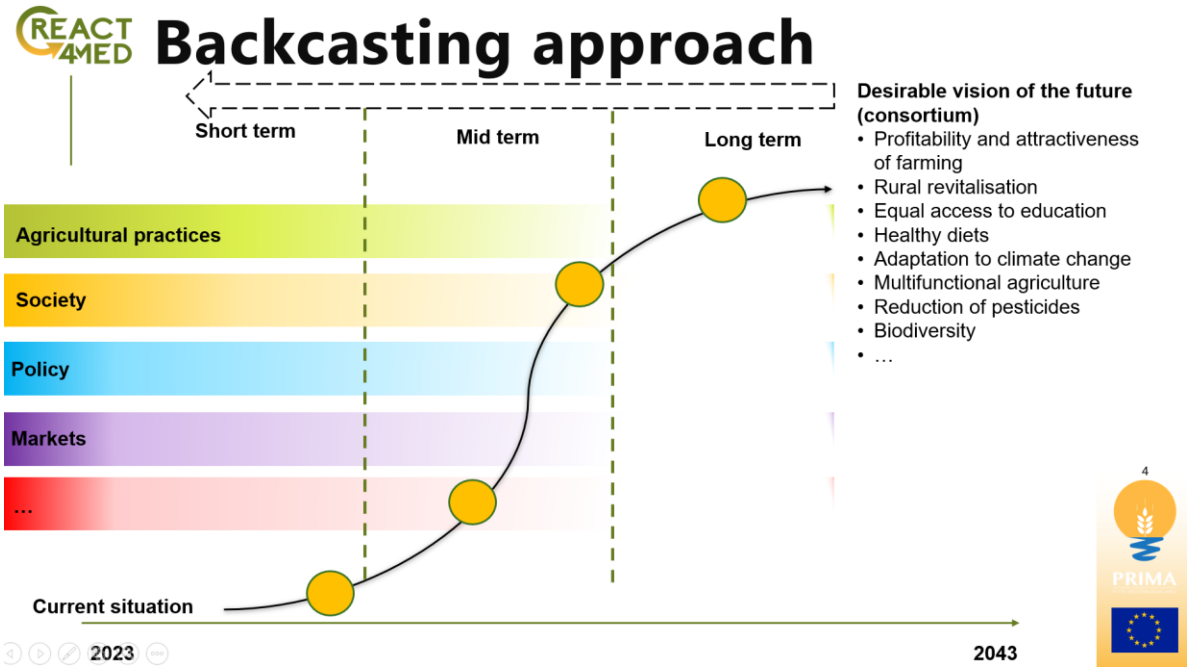

Figure 32: Generic backcasting timeline for a restoration action presented at the online consortium trial workshop to explain the method. The yellow circles are identified desired changes, whose identification is the first step of the exercise.

From the vision that was created during the second ERLL workshops, the stakeholders take part in a participatory backcasting exercise to reflect on actions that will contribute to the implementation of the imagined positive future. Doing so, also barriers will be addressed that need to be overcome and opportunities that can be exploited will be identified. Also, responsible actors, necessary actor constellations and policy recommendations will be identified.

Aim

- Assessment of barriers to and opportunities for the implementation or uptake of good practices by both practitioners and decision-makers
- Identification of steps and actions to overcome barriers and to use opportunities leading towards the positive visions
- Identify necessary stakeholders and create ownership for the identified actions and therewith up- and outscaling of good practices
- Identification of factors (such as capacities, governance, socio-economic conditions, economic instruments that facilitate public and private investments and cultural aspects) needed for up- and outscaling of good practices
- Stakeholder awareness and mutual learning regarding future actions as well as opinions of other stakeholders

Approach

In order to accommodate the different knowledge requirements regarding concrete practical change to support outscaling (i.e. the replication and dissemination of the restoration action in the field) and upscaling (i.e. facilitating the desired effects through policy interventions) of

the restoration action, two separate groups of stakeholders will address desired changes, their barriers and opportunities on different levels (Moore et al. 2015):

1 Group Upscaling with a focus on the restoration action: farmers, farm advisers, supply chain organisations (suppliers, retailers, cooperatives etc.), scientists
2 Group Outscaling with a focus on the landscape level and policies: policy makers, education, NGOs and consumer groups, scientists

Description of methods

With the goal to refresh the participants memory and to onboard new participants this exercise starts by re-visiting the formerly defined vision. The participants are familiarised with the vision and are invited to contribute their understanding of the desired future. After an agreement between the participants is found, the backcasting exercise guides the participants through the identification of major changes, barriers, opportunities and necessary actions and actors.

Reflection on vision

Purpose	• Familiarise the participants with the vision that they have developed in the previous workshop. • Adapt the vision where participants see fit, so that the participants feel comfortable with it and see their viewpoints represented. The final version should represent a common vision that every participant aspires to work towards. • Develop a common understanding from which the backcasting exercise starts.
Preparation and materials	• Based on the visions that were developed in the 2nd ERLL workshop, a summary vision is prepared by PALs beforehand. This summary vision focuses on what the visions in their PA have in common. Even though the focus can be on agriculture and related aspects, elements from all dimensions (agriculture, society, economy, policy, education and science) should be included. • Material: One poster/power point slide each with the vision and the discussion questions readable to everyone, paper and pens for participants to rake notes. **Important**: The problem situation as well as the vision summary should be sent to participants upfront (for instance with the invitation or together with the preparatory details).

Steps	• The facilitator presents the vision summary to the participants on power point or a large poster.
	• The facilitator encourages the participants to form groups of three people.
	• In the groups, the participants should exchange for 15 min on the following questions:
	  ○ What is your intuitive response: how does this vision make you feel?
	  ○ What do you like about it?
	  ○ What do you dislike about it?
	  ○ Is something missing?

	• After the 15 min, the facilitator brings the groups attention back into the plenary. Now, the common goal is to adapt the vision, so that everyone can work with it in the next step. The vision should still be desirable and ambitious. For this, the facilitator asks: "Regarding the vision summary, is something missing?" The answers are collected on a flipchart or the slide that shows the vision. • After collecting the feedback, the facilitator asks: "Is this vision representing a future that you would like to work towards?" If doubts are raised, they should be taken into account as far as possible. The vision should be adapted to represent a vision that every participant aspires to work towards. **Reminder**: Don't go into a discussion of barriers and problems. Identification of barriers and opportunities to this vision comes in the next step.
Output / Outcome	• An adapted version of the vision, that everyone is looking forward to work towards. It should be ambitious and desirable.
Role of participants	Being open minded about a desirable vision of the future of agriculture and decide whether the proposed vision is something they can agree upon. Contribute their wishes to the common vision.
Role of facilitators	Guiding the participants so that they can be open minded and think the desirable future. Guide the discussion away from topics such as feasibility and barriers (this will come in the next step). Synthesise a common vision that everyone agrees upon.

Up- and Outscaling: The backcasting method

Purpose	• Identify major changes, barriers and opportunities as well as actions and actors to up- and outscaling of restoration actions by both practitioners and decision-makers • Identify necessary stakeholders and create ownership for the identified actions and therewith up- and outscaling of good practices among participants • Identification of factors (such as capacities, governance, socio-economic conditions, economic instruments that facilitate public and private investments and cultural aspects) needed for up- and outscaling of good practices
About backcasting	Backcasting is useful when dealing with persistent and complex challenges that require long-term system transformation[1]. Vergragt and Quist (2011)[2] define it as "generating a desirable future, and then looking backwards from that future to the present in order to strategise and to plan how it could be

[1] Quist, J., Wittmayer, J., Van Steenbergen, F., & Loorbach, D. (2013, October). Combining backcasting and transition management in the community arena. In *Proceedings of the SCORAI Eur. InContext Workshop Rotterdam Neth*, 7-8.

[2] Vergragt and Quist. 2011. Backcasting for sustainability: Introduction to the special issue. *Technological Forecasting & Social Change* 78, 747–755.

	achieved" (p. 747). "Looking back" from the future, the approach allows participants to reflect on important changes (milestones) that were necessary to come closer to the desired future. Starting with these necessary changes, actions and actors are identified and barriers and opportunities are discussed. This is done looking at different societal sectors (agriculture, society, economy, markets, policies) while identifying requirements such as new knowledge and technologies, novel actor constellations, etc.[3]. Participants will create a map of steps (actions) and actors required in the short- and medium- to long-term.

Preparation and materials	• Presentation in the plenary of the Power point slides: Up- and outscaling of [restoration action]
	• Adapted vision from previous step either on power point or a flipchart paper
	• Material: Large poster (A0 or 2 A0s) for each group of six people (see templates below), large pens, moderation cards or sticky notes in different colours to illustrate different categories:
	  ○ Major changes
	  ○ Barriers
	  ○ Opportunities
	  ○ Actions and respective actors

Steps	The moderator briefly presents the exercise to identify potential for up- and outscaling of the restoration action (using the backcasting method). Participants are split in two kinds of groups that address different topics (max. of six participants, there can be several groups for each topic): 1. **Outscaling**: How can [restoration action] be widely taken up by farmers and land managers? Stakeholders: farmers, farm advisers, land managers and supply chain organisations (suppliers, retailers, cooperatives etc.), administration, scientists 2. **Upscaling**: How can we create beneficial conditions and policies in society for the uptake of [restoration action] and our desirable future of agriculture Stakeholders: policy makers, education, NGOs and consumer groups, scientists Each group sits at a table and has a poster with the graph and timeline on it. To the right, the updated vision should be visible. The moderator explains that starting from the vision, the participants now look back the pathway, how this vision was accomplished, based on the following steps: • Step 1: Defining milestones = **major changes needed to achieve vision** • Step 2: Identify **barriers that needed to be overcome and opportunities that could be used**

[3] Quist, J., and Leising, E. (Eds.). 2016. Green Lifestyles Alternative Models and Up-scaling Regional Sustainability / *GLAMURS: Work Package 5 Deliverable 5.2: Report on future lifestyle pathways and workshops*.

	• Step 3: Identify **actions** and respective **actors or actor constellations** To stimulate the debate and to draw on participants' knowledge, participants can be encouraged to consider different societally domains such as agriculture, society, policy, markets, environment. Also, participants can be encouraged to think about changes and actions that happen in the short- (5 years), medium- to long-term (10-20 years). The moderator writes down the information on the respective moderation cards and orders them on the graph. It is advised to start with major changes and then add relating barriers, opportunities and activities and actors. **If there are activities, it is important to name the respective actor(s).** Participants can be encouraged to think about actions, in which they can be involved. In the following, the steps are described with guiding useful questions: Step 1: Thinking back to the present: **identification of major changes** It is 2043 (in 2028?, between 2028 and 2043?), what has been reached and how do you notice the change regarding: Group 1 • **the restoration action?** • **the local community?** • **the local markets and economy?** • **the local environment?** Group 2 (depending on your stakeholders you may pick one of the options) • **(agricultural) policy?** • **education and research?** • **the relation between society and agriculture?** • Optional: the environment? • Optional: economy in country? Step 2: Identification of **barriers and opportunities** • What have been barriers on the way to reaching this milestone? • Which opportunities presented themselves? • (in case of many ideas) What were the most important barriers/opportunities? Step 3: Identification of **actions and actors or actor constellations** • What is needed to reach the milestones by overcoming obstacles and using opportunities? • Everyone asks him/herself (including the researchers) what can I do? • Who is in charge of the actions **Additional information:** Possible prompts for the facilitator of the group to keep discussion going: Think about… • New knowledge

	• Financial arrangements • New technologies • New political or economic frameworks • Significant changes in actor configuration • Cultural and formal conventions • Changes in routines, rules, culture, infrastructure…
Output / Outcome	Graph illustrating information on conditions (major changes, barriers and opportunities as well as actions and actors) for successful implementation of restoration action on two levels: 1. Outscaling: Practitioners input focussed on information regarding a spreading of the restoration action to other suitable sites 2. Upscaling: Decision makers input focussed on information regarding the implications for policies facilitating the uptake of the restoration action and to make the desirable future achievable • Participants are more aware of their agency (capacity to enact change), steps, activities and necessary coalitions to out- and upscale the restoration action and reach a desirable future
Role of participants	Contribute their knowledge and insights on the necessary conditions. Think proactively how positive change can be accomplished.
Role of facilitators	Guide the process in a structured and stepwise manner, so that participants can think freely about the different categories over the timeline. Instruct and remind participants to strategically think backwards from the desirable vision rather than projecting steps from the status quo.

Templates for the backcasting exercise

Group Outscaling: farmers, farm advisers, land managers and supply chain organisations (suppliers, retailers, cooperatives etc.), administration, scientists

	Short-term (5 years)				Mid-term to long-term (10-20 years)				Short-term (5 years)
	Major change	**Barriers**	**Opportunities**	**Actions (actors)**	**Major change**	**Barriers**	**Opportunities**	**Actions (actors)**	**Elements achieved**
RESTORATION ACTION									
LOCAL COMMUNITY									
MARKETS									
LOCAL ENVIRONMENT									

Group Upscaling: policy makers, education, NGOs and consumer groups, scientists

	Short-term (5 years)				Mid-term to long-term (10-20 years)				Short-term (5 years)
	Major change	**Barriers**	**Opportunities**	**Actions (actors)**	**Major change**	**Barriers**	**Opportunities**	**Actions (actors)**	**Elements achieved**
(AGRICULTURAL) POLICY									
EDUCATION AND RESEARCH									
RELATION BETWEEN SOCIETY AND AGRICULTURE									
OPTIONAL: ECONOMY									
OPTIONAL: ENVIRONMENT									

Silent discussion to collect feedback

Purpose	• Present identified changes, steps and actors in the plenary • Collect feedbacks from actors that have been assigned activities and receive feedback on the proposed activities
Preparation and materials	• Posters from previous exercise • Large sticky notes and large pens for written feedback
Steps	1. After meeting in the plenary, the different groups present their results. Then the participants are invited to give feedback to the activities that concern them. 2. They receive sticky notes and pens and can go around to the different timelines that were created. To activities for which they are mentioned they can add information they would like to share. 3. After this silent discussion to receive feedback by participants that were not involved in creating the timeline, the groups are asked, whether and what they would like to do with these agendas of activities they have discussed.
Output / Outcome	Written feedback yielding additional information by actors that are affected by the proposed activities.
Role of participants	Feedback with additional information on activities that concern them. Participants of the groups giving an indication how they like to proceed with the gathered information.
Role of facilitators	Showing participants that their insights on the proposed activities matter. Giving participants opportunities to formulate the possible next steps they would like to take drawing on the network that was created during the ERLL.

Exemplary results

Outscaling template: Canyoles River Basin (provided by A. Cerdà)

	Short-term				Mid-term to long-term				Vision
	Barriers	**Opportunities**	**Actions (actors)**	**Major change**	**Barriers**	**Opportunities**	**Actions (actors)**	**Major change**	**Elements achieved**
AGRICULTURE	The use of pesticides. The farmers are adapted, and it will be difficult to change.	New local markets Organic farming	Organic farming and organic farmers	The reduction of the use of pesticides. Mechanization.	Soil and land degradation	New crops such as Pitaya and tropical crops	Use of chipped pruned branches. Catch crops. Organic farming	Organic farming more popular	Widespread use of restoration actions in agriculture
COMMUNITY	Ageing is the big barrier. Also, the emigration to the cities. Land abandonment	Bring new citizens and farmers to recover the population in the rural areas	To build a well-structured community	Maintain the rural communities as a source of stability for the society	Degradation of the local communities	Develop new and structured societies with the arrival that well educated citizens from the cities.	Farmers and shepherds	Society that understands the quality of the products from agriculture	Integrated society with agriculture understood as a basic part of the society

MARKETS	Low prices of agriculture products due to the subsidies and abuse of production in large farms (agroindustry)	Large market in the coastal land	Local markets	Expand the local markets	Loss of local markets	Increase in prices due to the new local market	High prices for quality food	Improve in the income of the farmers	Fair prices for the agriculture products
ENVIRONMENT	Degraded soils Polluted water.	The recovery of beautiful landscapes	Protect the landscapes and their ecosystems services	Desertification	Climate change	The landscape is a commercial opportunity	Improvement of soils and vegetation cover		

Upscaling template: Canyoles River Basin (provided by A. Cerdà)

	Short-term				Mid-term to long-term				Vision
	Major change	**Barriers**	**Opportunities**	**Actions (actors)**	**Major change**	**Barriers**	**Opportunities**	**Actions (actors)**	**Elements achieved**
AGRICULTURAL POLICY	Include the quality of the agriculture product as a target. No quantity.	The lack of education.	New generations with more information	New farmers	The use of subsidies	The perception of the society that farmers are just receiving subsidies without their own investment.	The new markets from the local areas but also from the nearby urban areas.	To promote organic farming	A more sustainable agriculture
SOCIETY	Reduce the ageing	Ageing	New farmers that arrive from urban areas	Young people	Restore abandoned land	Governamental bureaucracy	The prestige of the organic farming	Recover young farmers. Built new local markets	Strong and stable community
MARKETS	Prices of organic farming products	Lack of information of the quality of the agriculture products	New and well-educated citizens	Consumers	Prices of organic farming products	Lack of information of the quality of the agriculture products	New and well-educated citizens	Consumers	Develop a new market of citizens that accept the contribution of the farmers to the society and pay fair prices.

ENVIRONMENT	Restore nature based process and avoid chemicals	Degraded soils	New generations believe in organic farming, old farmers are frustrated with the chemical farming	New pests can stop the process	Improve in the fertility of soils	Climate change with the arrival of new climatic conditions but also the arrival of new pest	A new society, a new life for the farmers. Better quality of life.	The new environmental challenges are key actions with new citizens as actors.	New society that will built a new agriculture. A new agriculture that will help to achieve a more sustainable society.
AGRICULTURE	Farmers were adapted to a mechanized and pesticide base agriculture.	Organic farming markets should be promoted as a key for the future	Organic farmers must be the heroes	Les pesticides and chemical fertilizers. More life.	The degradation of the soils around the fields. We must restores	We need new crops adapted to the climate and avoid the import of traditional products such as oranges.	A new agriculture with alternative managements	Promote organic farming	The use of restoration strategies should be general.

5 Reflections and outlook

Science and practice interface

The integration of scientific and practical knowledge resulting in real-world change, requires an understanding of the nuanced and context-specific needs of various stakeholders and suitable participatory approaches in each location. This necessitates a case-sensitive approach in which PALs possess the requisite knowledge about their stakeholders in order to develop appropriate methodologies that yield the desired outcomes. Furthermore, establishing effective feedback loops is essential for adapting these methodologies over time. Given the considerable variability in the local circumstances, it becomes clear, that there is no “one size fits all” solution for the participatory approach, its methods and timing. For example, while the formulation of a common vision is advocated to align stakeholders around a shared goal, in Morocco such a vision has already been established by stakeholders as a political target. In this instance, the creation of another alternative vision within the ERLL would have been superfluous and potentially counterproductive.

At the outset of the project, the experiences with stakeholder engagement and the familiarity with different stages of engagement varied significantly across PAs. Some PALs started their ERLLs being able to draw on pre-existing relationships with their stakeholders, already having a good understanding of their respective interests and needs. Conversely, other PALs were required to start with a stakeholder analysis, gradually building relations and trust. This diversity necessitated a flexible frame for participatory activities so that PALs could choose and adapt the formats that were most conducive to the specific context and timing.

Moreover, many stakeholders are still not accustomed to interactive formats. Encouraging and supporting participants requires an understanding of the stakeholders’ needs and capacities. Besides a familiarity with the stakeholders and their contexts, this new way of collaboration also requires the ability to understand when and how stakeholders are ready to address different topics. Additionally, it may be necessary to allow time for contemplation and revisit pertinent questions at a later stage. Consequently, transdisciplinary collaboration demands a level of time investment and skill that is not common in conventional nature science-based scientific project work. To achieve the appropriate outcome and to foster meaningful engagement, PALs need to be observant and maintain close contact with their stakeholders in order to adapt flexibly to emerging situations.

The interactive work with stakeholders oftentimes requires unfamiliar approaches, such as visiting stakeholders in their environment and creating a welcoming atmosphere conducive to open dialogue.

Despite acknowledging the challenges of transdisciplinary projects faced by stakeholders as presented above, it is equally crucial to recognise that the chosen approach also presents a challenge to scientific partners in the project. While many project partners possessed substantial experience in stakeholder consultations, transdisciplinary research and particularly the operation of living labs, require a sophisticated level of moderation and refection that most project partners were not familiar with. In practice this means that considerable training is necessary to facilitate the effective delivery of workshops. Ample experience in transdisciplinary research and the ability and flexibility to react to stakeholder needs are necessary for the approach to unfold its full potential.

Rural ERLLs

The implementation of living labs within rural communities presents distinctive challenges for their organisers. The geographical remoteness of certain stakeholders, such as farmers, necessitates the

development of effective communication strategies to bridge the given geographical and disciplinary distance. Building trust and trust and lasting relationships require substantial commitments of time and human resources. The experience of the PALs concerning this extensive stakeholder engagement differed across pilot areas. Hence, in some cases the resources needed for preparation, implementation and wrap-up of stakeholder events were vastly underestimated. While in others, recurrent personal invitations as well as cultural frame programmes were employed in order to enhance stakeholder engagement effectively.

To establish lasting relationships and a platform for joint learning, transdisciplinary research and the application of living labs should be supported by social scientists within the pilot areas, who are acquainted with the respective methods and have the capacities to deal with the locally specific challenges.

Political situation and external influences

The political conflict between Israel and its neighbouring regions has severely constrained the implementation of on-site stakeholder engagement. Safety concerns and the pervasive uncertainty surrounding the situation rendered it impractical to conduct living lab workshops. Likewise, exercises such as vision building, simply proved to be inappropriate in the given state of events. Hence, the methodology was adapted to more suitable online formats.

Moreover, external factors such as severe regional drought in Morocco and the occurrence of presidential elections in Egypt complicated the timely execution of workshops. Despite these challenges, the implementation of participatory approaches has proven to be a fruitful endeavour, benefiting both scientific partners and stakeholders alike.

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