A SOCIO-ECOLOGICAL APPROACH TO COMBAT DESERTIFICATION FOR SUSTAINABLE FUTURE

EcoFuture

Work Package 1

Deliverable 1.3 Mapping of WEFE priorities

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Table of Contents

List of figures

List of tables

This project is part of the PRIMA programme supported by the European Union. GA n° [2243] [EcoFuture] [Call 2022 Section 1 NEXUS WEFE IA].

Executive Summary

The objective of stakeholder engagement of Phase I of EcoFuture project was to identify and prioritize the challenges and priorities in each territory of the JV. In Deliverable 1.2, the development and analysis of CLD was the result of the input obtained from the mapping of WEFE resources (D1.1), socioecological mapping (D2.1) and governance mapping (D5.1). The Living Labs/interviews conducted in each of the three countries gave feedback to the prioritization of challenges facing the JV. Based on the mapping of the WEFE resources (supply and demand), the CLD developed for the JV, and hydrologic analysis (D3.1), water allocation (D3.2) and energy analysis (D3.3) of the region, we conducted two workshops (one Jordanian and Palestinian Joint workshop and one Israeli workshop) with the stakeholders to identify the priorities for each country and for the JV as a whole (D1.3). We followed the capacity factor analysis methodology where the stakeholders ranked the challenges, issues and problems and thus set priorities to the problems that need to be addressed in the region. The results of the workshops will be used as feedback for the gap analysis (D5.2).

The workshops conducted a Community Capacity Assessment that assessed the capacity of the stakeholders to address their highest priority challenges by identifying the problems and barriers to fulfil the priorities. We assessed the following four challenges in the Jordanian/Palestinian workshop: Water quality, water demand for irrigation, soil quality and agricultural development. The challenge renewable energy availability was assessed as part of the energy capacity horizontally. Similarly, the Israeli workshop addressed the following four challenges: Climate change, Competition between development and land conservation, Biodiversity, Renewable energy availability. A set of questions were developed to measure the institutional capacity, human resources capacity, technical capacity, economic and financial capacity and energy capacity for each of the challenges identified.

By quantifying these capacities, the current status of the community can be better described, leading to a better understanding of the type of intervention needed and which community capacity(ies) will need to get more attention.

The results showed that there is a noticeable disparity in the levels of various capacities among the participants from different jurisdictions. Jordanians and Palestinians face challenges due to a limited educational background, limited access to proper training and capacity-building activities, a limited understanding of regulations and standards and additionally, they lack access to new technologies. In contrast, Israelis benefit from a more established environment, where the primary challenge is financial rather than access to training and expertise. They also possess a deeper understanding of regulations and better community organization.

To address these challenges, it is crucial to design interventions that not only address the identified priorities but also consider these existing differences. A comprehensive approach should include targeted training programs, improved access to modern technologies, and enhanced understanding of regulatory frameworks. Financial assistance and the promotion of renewable energy sources are also essential. These measures will help develop a resilient and sustainable agricultural sector in the region.

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1. Introduction

The overall objective of the EcoFuture project is to propose a climate change adaptation Plan for the JV region, based on existing technologies, taking into account the social and economic priorities of the three involved countries (Jordan, Israel and Palestine). The first phase of this analysis aims to identify the conflicts, gaps and proposing changes with stakeholder engagement. Stakeholder engagement in EcoFuture consists of three phases (described in Deliverable 1.2).

The objective of stakeholder engagement of Phase I was to identify and prioritize the challenges and priorities in each territory of the JV. In Deliverable 1.2, the development and analysis of CLD was the result of the input obtained from the mapping of WEFE resources (D1.1), socioecological mapping (D2.1) and governance mapping (D5.1) (Figure 1). The Living Labs/interviews conducted in each of the three countries gave feedback to the prioritization of challenges facing the JV.

Based on the mapping of the WEFE resources (supply and demand), the CLD developed for the JV, and hydrologic analysis (D3.1), water allocation (D3.2) and energy analysis (D3.3) of the region, we conducted two workshops (one Jordanian and Palestinian Joint workshop and one Israeli workshop) with the stakeholders to identify the priorities for each country and for the JV as a whole (D1.3). We followed the capacity factor analysis methodology where the stakeholders ranked the challenges, issues and problems and thus set priorities to the problems that need to be addressed in the region. The results of the workshops will be used as feedback for the gap analysis (D5.2). With the completion of the gap analysis, the first phase of stakeholder engagement will be completed and we will move into the next two phases where we will co-design with them the alternative solutions (using multicriteria analysis) and the Strategic Plan for climate change adaptation and mitigation.

Deliverable 1.3 according to the GA is an outcome of a joint workshop between the three territories. The geopolitical situation and the war in Gaza has affected all partners of the project and specifically the transnational living labs. The first Transnational Living Lab was scheduled to take place February or March of 2024. Given the situation, we had to postpone the timing of the workshop as well as instead of one workshop, to have two workshops, one Jordanian and Palestinian Joint workshop and one Israeli workshop. This decision was strengthened by the fact that according to CLD analysis, the Jordanian and Palestinian stakeholders had set similar highest priorities, while Israeli stakeholders set different priorities.

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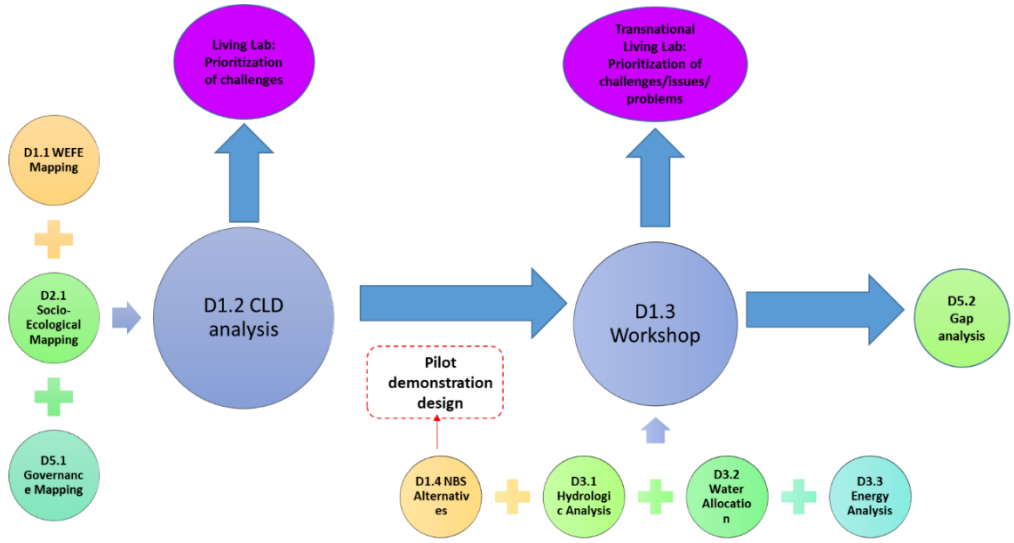

Figure 1. Phase I of developing the climate –change adaptation Plan for the JV

The objective of this deliverable is to conduct two workshops (one Jordanian and Palestinian Joint workshop and one Israeli workshop) in order to specify and rank the challenges and issues in the JV and set priorities using a Community Capacity Analysis methodology.

The Community Capacity Analysis, also known as the Capacity Factor Analysis (CFA) was proposed by Professor Garrick Louis and coworkers at the University of Virginia, Charlottesville (Ahmad 2004, Bouabid 2004) to determine the capacity of a community to provide Municipal Sanitation Services (Drinking Water Supply, Wastewater and Sewage Services, and the Management of Solid Waste) for itself. The CFA consists of three consecutive steps: 1. Map the capacities to provide a specific service, 2. Determine a score for each type of capacity and 3. Identify the Community Capacity Assessment. In the scope of this deliverable, the CFA was used to understand the level at which the current status of the priority is at, and find out what the ability of the stakeholders to manage the priority under investigation.

First, all eight forms of capacity, each with specific requirements Ni, must be mapped:

1. *Service capacity* assesses the current level of service (e.g., quantity, quality, and accessibility of drinking water supply per day per capita).
2. *Institutional capacity* defines the components of the institutional framework that needs to be in place to provide the services.
3. *Human resources capacity* relates to the labor that is available to provide the services and its level of training.
4. *Technical resources capacity* relates to the logistics necessary to address the components of technology that are needed for the implementation of solutions.

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5. *Economic and financial capacity* represents the financing of the services, the availability of loans, and the financial assets in the community.
6. *Energy capacity* deals with the available energy, its availability, its costs, and reliability.
7. *Environmental capacity* looks at the availability of natural resources (water, forest, etc.) needed to implement the solutions.
8. *Social and cultural capacity* deals with the community structure and components.

The second step in the CFA approach is to determine a score for each type of capacity for a given type of service. This is referred to as a capacity factor. It is calculated as the weighted sum of each capacity's requirements.

Finally, the third step in the CFA approach is to identify a Community Capacity Assessment, or CA, defined as the lowest value among capacity factors for each type of service. The CA value is used to specify ability of the community to provide and manage the specific service.

For deliverable 1.3, a simplified CFA analysis was conducted due to practical limitations as described in the methodology section.

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2. Methodology

The project team conducted a simplified Community Capacity Assessment, taking into account the diverse backgrounds of the living lab participants and the complexity of the challenges they face. Utilizing their expertise and insights gained from in-depth workshop discussions, the team identified key drivers influencing the prioritization process. This approach enabled them to evaluate the current capacity of the participants' communities effectively.

The two workshops used the community capacity assessment methodology to understand the capacity weaknesses among the different communities in regard to the identified challenges and priorities in the CLD Assessment. The stakeholders of the 3 territories have set priorities in the challenges they are facing in the JV. The Jordanian stakeholders had set as highest priority water quality, water demand for irrigation, soil quality and agricultural development. The Palestinian stakeholders had set similar highest priority water quality, water demand for irrigation, agricultural development and renewable energy availability. On the other hand, the Israeli stakeholders had set as highest priorities climate change, land competition, biodiversity and renewable energy availability (Table 1).

Table 1. Stakeholder prioritization of challenges facing in the JV

	Jordan	Israel	Palestine
Highest priorities	1) Water quality 2) Water demand for irrigation 3) Soil quality 4) Agricultural development	1) Climate change 2) Competition between development and land conservation 3) Biodiversity 4) Renewable energy availability	1) Water demand for irrigation 2) Water quality 3) Agricultural development 4) Renewable energy availability
Lesser priorities	5) Biodiversity 6) Climate change 7) Renewable energy availability 8) Governance	5) Population growth and Sanitation services 6) Agricultural development 7) Water quality	5) Climate change 6) Biodiversity
Last priority	9) Population growth	8) Water demand for irrigation	7) Population growth

Therefore, the workshops conducted a Community Capacity Assessment that assessed the capacity of the stakeholders to address their highest priority challenges by identifying the problems and barriers to fulfil the priorities.

We assessed the following four challenges in the Jordanian/Palestinian workshop: Water quality, water demand for irrigation, soil quality and agricultural development. The challenge renewable energy availability was assessed as part of the energy capacity horizontally. Similarly, the Israeli workshop addressed the following four challenges: Climate change, Competition between development and land conservation, Biodiversity, Renewable energy availability. A set of questions were developed to measure

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the institutional capacity, human resources capacity, technical capacity, economic and financial capacity and energy capacity for each of the challenges identified (Appendix A).

Table 2 presents the requirements used in this study to measure the five capacity factors. Each capacity had a set of requirements to be measured so its status can be described clearly, the table below shows some examples of these requirements. The set of questions can be designed to measure each of these requirements, furthermore, the list of requirements can be edited and updated based on the collected data regarding the current situation.

Table 2. Requirements used in this study to measure the five capacity factors.

Capacity factors	Requirements
Human capacity requirements (Human resources capacity relates to the labor that is available to provide the services and its level of training.)	- Educational level - The level of knowledge of their own systems - Received training on the technology and involvement in operating the systems and other topics related to the issue. - Ability to perform the required operation and maintenance - The understanding and acceptance of the use of treated wastewater in irrigation
Technical capacity requirements (Technical resources capacity relates to the logistics necessary to address the components of technology that are needed for the implementation of solutions.)	- Operations, maintenance, upgrading or adaptation, and supplies. - Understanding of the technologies - Understanding the restrictions in treated water use - Ability to operate the system - Ability to maintain the system - Current status of the system - Availability of technical solutions and spare parts in the local market. - Knowledge of existing technical support schemes in their community
Institutional capacity requirements (Institutional capacity defines the components of the institutional framework that needs to be in place to provide the services.)	- Associated regulation - CSO support and follow-up - Cooperative membership and knowledge - Existing structure - Water supply (quality and quantity)
Financial and economic capacity requirements (Economic and financial capacity represents the financing of the services, the availability of loans, and the financial assets in the community.)	- Income generating activities - Income/expenditure ratio - Expenditures priorities - Water and sanitation costs - Willingness to pay (system cost, O&M)
Energy capacity requirements (Energy capacity deals with the available energy, its availability, its costs, and reliability.)	- Primary sources - Back-up sources - Percentage of budget - Rate of outage

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By quantifying these capacities, the current status of the community can be better described, leading to a better understanding of the type of intervention needed and which community capacity(ies) will need to get more attention.

The workshops were conducted in three phases:

1. The results of the EcoFuture project were presented in order to provide the necessary data and information regarding the status of the JV (Appendix B).
2. Stakeholder discussion on the questions derived from the Community Capacity Analysis. Depending on the number of stakeholders, they were divided in one or two groups and discussed all questions identified in the CCA.
3. Finally, the stakeholders were given the same questionnaire to be filled out in order to collect more detailed information and confirm the results from the discussion.

Due to the large group size, the participants were divided into two sub-groups to discuss the major challenges faced by both the Jordanian and Palestinian sides. The discussion focused on identifying similarities in challenges related to capacity factors and requirements concerning water quality, water demand for irrigation, soil quality, and agricultural development. The findings and proposed solutions from each sub-group were then presented, fostering a collaborative atmosphere and a shared understanding of common issues.

The discussion was based on the questions listed in Appendix A, which were used as a conversation started in the discussion, the questions addressed the different capacities to identify the main drivers behind ranking the priorities determined by them.

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3. Results

3.1 Jordanian and Palestinian Joint workshop

The workshop took place at the National Centre for Agricultural Research (NARC) on July 1st and 2nd, 2024 (Figure 2). On the first day, participants engaged in group discussions focused on project updates and community capacity analysis. The second day featured a site visit to the Jordanian pilot project in the Jordan Valley. The workshop agenda is presented in Appendix C. The workshop participants included the project teams from NARC, Damour, and i.GREENs, as well as living lab participants from Jordan and Palestine (Appendix C-Participant list). Specifically, 27 people in total attended the workshop. 12 out of 27 were farmers, 2 out of 27 were policy makers and 13 out of 27 were scientists and experts. 17 out of 27 people were Jordanians and 10 Palestinians.

Figure 2. Photographs of the Jordanian/Palestinian Joint workshop

The workshop outcomes were analyzed, focusing on assessing the communities' capacity to address the identified challenges. This assessment will inform the gap analysis, where detailed Key Performance Indicators (KPIs) will quantify the gaps and identify potential solutions.

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Human capacity: The participants had varied educational backgrounds, mostly at the high school level, with a few holding bachelor's degrees, though none specialized in agriculture or related fields. Despite receiving training on water quality, their understanding was primarily focused on salinity and nutrient levels, viewing desalination and wastewater treatment as improvement methods. Maintenance tasks were generally handled by the farmers themselves, which added another layer of inefficiency due to their limited educational backgrounds.

Trainings were provided mainly by the National Agricultural Research Centre (NARC), the European Union (EU), Acted, the Ministry of Agriculture (MoA), and the Dutch Embassy initiatives.

For irrigation water demand, decisions on water quantity were largely based on experience, with some assistance from the Jordan Valley Authority (JVA), Water User Associations (WUAs), and various NGOs. Palestinian participants received more training on irrigation techniques, while Jordanian participants received guidance primarily from companies on using their products, supplemented by extension agents. Technologies employed included drip irrigation, water filters, and fertilizer injectors.

Regarding soil quality, training was more prevalent among participants in Palestine than in Jordan. Jordanian participants had limited knowledge of soil quality, while Palestinian participants used indicators such as plant growth changes, solarization, and crop rotation. To improve soil quality, both regions used animal manure and were familiar with compost, though its usage was limited. For agricultural development, training on irrigation systems was common, with some participants involved in Water Users Associations. However, cooperatives were not seen as supportive, and there was a lack of understanding regarding their structure and roles.

The Risk Fund was noted to cover damage related to frost and climate change but did not extend support to combat agricultural diseases such as the red palm weevil.

Technical Capacity: Maintenance was typically reactive, with only a few farmers having a seasonal maintenance schedule. Information on new technologies was primarily obtained from companies, their agents, and pioneer farmers, with social media also being a source. Access to better technologies was considered crucial for easing farm work. Water quality assessments relied on feedback from the Water Authority, with some farmers conducting field tests for salinity. Although all farmers recognized the importance of laboratory analysis, none reported using it. Irrigation technologies and spare parts were generally accessible, with commonly used equipment including drip lines, water filters, and fertilizer injectors. Techniques to enhance soil quality, such as applying manure, fertilizers, and solarization, were well-known and widely practiced. However, participants' knowledge about agricultural cooperatives was very limited in Jordan and non-existent in Palestine.

Institutional Capacity: The participants displayed limited knowledge of the laws, regulations, and standards governing water quality, irrigation, water allocation, and cooperatives in their communities. Key institutions like the Jordan Valley Authority (JVA), Ministry of Agriculture (MoA), National Agricultural Research Centre (NARC), Acted, and the Water Authority were recognized as significant stakeholders. While participants had some awareness of local standards and regulations for water quality and irrigation, they understood that JVA and the Water Authority managed water quality and distribution, with Water Users Associations (WUAs) and groundwater well operators playing a role in water allocation decisions.

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Regarding soil quality, institutions like JVA, MoA, the Water Authority, and private companies were mentioned. However, participants were generally unaware of the specific soil conditions and standards required for their crops. In agricultural development, MoA, research centers, universities, and JVA in Jordan, along with the Water Authority, MoA, and farmer groups in Palestine, were highlighted. While participants had some awareness of unions and cooperatives, they lacked knowledge about the laws and regulations governing agricultural activities.

Financial and Economic Capacity: Financial and economic capacity was identified as a crucial factor for farmers in both Jordan and Palestine. They frequently cited limited budgets as the primary constraint on acquiring new technologies and improving water and soil quality. In Jordan, monthly water costs ranged from 15-50 JD, while most Palestinian farmers did not pay for water. Monthly energy costs in Jordan ranged from 100-400 JD, with Palestinian farmers generally not incurring these costs. Annual operation and maintenance expenses were 240 JD in Palestine and 300 JD in Jordan. While Jordanian participants were somewhat satisfied with land productivity, both groups were dissatisfied with the financial returns.

Energy Capacity: The primary energy source for participants was grid electricity from national companies, generally reliable except for some disturbances reported by Palestinian farmers. Renewable energy use was minimal, with most reliance on grid electricity. Some farmers had backup generators. Energy costs accounted for about 10-15% of income for Jordanian participants. This thorough discussion highlighted key challenges and potential solutions across various capacity factors, promoting a collaborative approach to improving agricultural practices in the region.

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3.2 Israeli workshop

The workshop took place at the Innovalley offices on July 22nd, 2024 (Figure 3). The workshop participants included the project teams from AIES and TAW, as well as living lab participants from Israel (Appendix D-Participant list). Specifically, 14 people in total attended the workshop. 6 out of 14 were farmers, 4 out of 14 were policy makers and 4 out of 14 were scientists and experts.

Figure 3. Photographs of the Israeli workshop

Firstly, Shlomo Wald introduced the EcoFuture project, its transboundary nature and the WEFE nexus, and the project's attempt at a holistic approach in solving environmental problems of the area. David Lehrer introduced the concept of the Living Lab, and what and how we are trying to achieve. Yoram Karin gave an overview of the area of Valley of Springs (Emek HaMa'ayanot), touching on the topography, population and recent growth, climate, and main sources of income for the inhabitants. Also discussed opportunities and challenges of the Valley's eastern border bordering Jordan and being a central point for trade for the region, and the potential of having a trade centre in a 'no man's land' between the two countries where ideas and skills can be exchanged safely. Introduced the central role the fishing industry has always had in the Valley, and the agricultural cooperations of the area. Finally, Guy Rubenstein

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introduced conflicts for the Ministry of Agriculture regarding the environment, recent reforms and regulations, specifically in relation to the fishing industry.

- **Human capacity:** The participants demonstrated a basic understanding of climate change issues, with a primary concern focused on its impact on water accessibility and the occurrence of extreme weather events such as droughts and floods. They emphasized the importance of intergenerational information exchange as a crucial element for adapting to climate change. However, there was a notable lack of knowledge about how to prepare and adapt for expected changes, which was expressed through various questions. While there was limited awareness of Nature-Based Solutions (NBS) and dual land use, the participants displayed a solid grasp of renewable energy concepts.
- **Technical capacity:** The participants displayed a good level of knowledge about the technologies available in their field of work. However, they identified financing as the main obstacle to acquiring these technologies. Additionally, there was some hesitation expressed about their experience and ability to effectively use these technologies.
- **Institutional Capacity:** The participants demonstrated a strong awareness of the various institutions involved in enhancing climate change adaptation in the valley. They specifically mentioned the Ministry of Agriculture, the Ministry of Economy, the Ministry of Finance, the Water Authority, the Water Drainage Authority, the Ministry of Environmental Protection, and the regional forum. They displayed a good understanding of the regulations, standards, and requirements set by these institutions and discussed the limitations these regulations impose. While they had some understanding of transboundary issues, they lacked detailed knowledge on the subject.
- **Financial and Economic Capacity:** The participants voiced concerns about the rising cost of water and its potential impact on their businesses.

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4. Conclusions

The assessment of various capacities among farmers in Jordan and Palestine highlighted several key findings and areas for improvement.

Human Resources: Participants had diverse educational backgrounds, with limited agricultural specialization. Training primarily focused on basic aspects of water quality and irrigation, with a lack of comprehensive understanding in soil quality and cooperative functions. Improvement is needed in specialized training and awareness of agricultural cooperatives.

Technical Capacity: There was a reactive approach to maintenance and limited use of advanced technologies. While basic irrigation technologies were accessible, the use of laboratory analyses for water quality was rare. Enhanced technical training and access to advanced tools are recommended.

Institutional capacity: Participants had limited knowledge of regulations and standards for water and soil management. Key institutions were recognized, but there was a lack of understanding regarding the legal framework governing agricultural cooperatives. Increasing awareness and knowledge of relevant laws and regulations is crucial.

Financial constraints were a significant barrier to adopting new technologies and improving agricultural practices. Costs for water and energy were burdensome, with participants generally dissatisfied with financial returns. Financial support and cost-effective solutions are needed to alleviate these issues.

Energy Capacity: Reliance on grid electricity was predominant, with minimal use of renewable energy sources. Energy costs impacted income, highlighting the need for affordable and sustainable energy options.

On the other hand, the key findings from the Israeli living lab workshop were as follows:

The participants displayed a foundational understanding of climate change issues, particularly concerning water accessibility and extreme weather events. They highlighted the necessity of intergenerational information exchange for effective adaptation, yet revealed gaps in their preparedness and knowledge, especially regarding Nature-Based Solutions and dual land use. While they possessed good technical knowledge of relevant technologies, financial constraints and hesitations about practical experience remain significant barriers. Additionally, the participants demonstrated a comprehensive awareness of the roles and regulations of key institutions involved in climate adaptation, despite lacking detailed insights into transboundary issues. Lastly, financial concerns, particularly the rising cost of water, emerged as a critical economic challenge for their businesses. Overall, these findings underscore the need for improved education, financial support, and institutional collaboration to enhance the community's capacity to adapt to climate change.

Overall Recommendations: There is a noticeable disparity in the levels of various capacities among the participants from different jurisdictions. Jordanians and Palestinians face challenges due to a limited educational background, limited access to proper training and capacity-building activities, a limited understanding of regulations and standards and additionally, they lack access to new technologies. In contrast, Israelis benefit from a more established environment, where the primary challenge is financial

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rather than access to training and expertise. They also possess a deeper understanding of regulations and better community organization.

To address these challenges, it is crucial to design interventions that not only address the identified priorities but also consider these existing differences. A comprehensive approach should include targeted training programs, improved access to modern technologies, and enhanced understanding of regulatory frameworks. Financial assistance and the promotion of renewable energy sources are also essential. These measures will help develop a resilient and sustainable agricultural sector in the region.

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Appendix A - Community Capacity Assessment questions

Jordanian and Palestinian Joint workshop				
Capacity factors	**Water Quality**	**Water Demand for Irrigation**	**Soil Quality**	**Agricultural Development**
Human capacity requirements (Human resources capacity relates to the labor that is available to provide the services and its level of training.)	1. What is the highest level of formal education you obtained? 2. Did you participate in any training focusing on water quality and testing? 3. What does water quality mean to you? 4. How do you improve the water quality? 5. Who provide the required maintenance to the water system you have?	1. How do you decide on the amount of water needed to irrigate your crops? 2. Do you try to get the help of others (governmental, NGO, individual, etc.) to decide on water quantity? 3. Did you participate in any training focusing on irrigation techniques? 4. Do you use specific technologies for irrigation?	1. Did you get any training on soil quality and its importance? 2. How do you know the current quality of the soil? 3. Did you try to improve the soil quality in your farm? How? 4. Did you hear about using organic fertilizers? The use of Compost?	1. Do you, or did you, receive any training to improve your agricultural practices? 2. Do you know what an agricultural cooperative is? Are you part of any? 3. What do you think of such cooperatives? Good? Bad? Why?
Technical capacity requirements (Technical resources capacity relates to the logistics necessary to address the components of technology that are needed for the implementation of solutions.)	1. Do you have a schedule for maintenance of the machines and other equipment in your farm? 2. How do you learn about the new available technologies? 3. How important is improving the technology you have for you?	1. How available are the technologies you use in the market? Spare parts? 2. What technologies do you use for irrigation?	1. Did you try to adapt techniques to improve the soil quality in your farm? How? 3. what techniques are you using to increase the organic carbon content in the soil? 4. Have you heard of composting? And manure usage?	1. Do you know how agricultural cooperatives work?

	4. What tools and methods do you use to know the quality of the water you use?			
Institutional capacity requirements (Institutional capacity defines the components of the institutional framework that needs to be in place to provide the services.)	1. What are the existing institutions that can help you understand the water quality that you have? 2. Do you know what are the standards and regulations in your country? 3. Who is responsible for the water quality in your region? How do they check it?	1. What are the existing institutions that can help you understand the available water quantity? 2. Do you know what are the standards and regulations in your country for irrigation? 3. Who is responsible for the water distribution in your region? How do they decide of allocations?	1. What are the existing institutions that can help you understand the soil quality that you have? 2. Do you know what are the required soil conditions and standards for the crops you are growing?	1. What are the available institutions in your region that focus on agricultural development? 2. Are you aware of any unions/cooperatives/organizations in your area? 3. Do you know the laws and regulations that govern such activities?
Financial and economic capacity requirements (Economic and financial capacity represents the financing of the services, the availability of loans, and the financial assets in the community.)	1. What are the top three most important issues you are facing toward improving your well-being (water quality, water quantity, water cost, electricity supply, electricity cost, wastewater disposal method, wastewater disposal cost, etc.)? 2. What is the monthly cost of water? 3. What is the monthly cost of energy? 4. How much do you spend on O&M? 5. Are you happy with your land productivity?			
Energy capacity requirements (Energy capacity deals with the available energy, its availability, its costs, and reliability.)	1. What is your primary source of energy? 2. How reliable is the energy supply from the main source? 3. Do you use any form of renewable energy? Why? Why not? 4. Do you use any backup system? 5. What percentage of your expenditures go to cover energy cost?			

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Israeli workshop				
Capacity factors	**Climate change**	**Competition between development and land conservation**	**Biodiversity**	**Renewable energy availability**
Human capacity requirements (Human resources capacity relates to the labor that is available to provide the services and its level of training.)	1. Will climate change have a direct impact on you? How? 2. Do you feel you have enough knowledge to be able to adapt to the impact of climate change? 3. What additional knowledge or training do you think you need to adapt to climate change? 4. Are you aware of how Nature-based Solutions can address climate change through mitigation and adaptation?	1. Do you see competition between development and land conservation as a problem? 2. Are there examples of dual use of land for production and conservation in the valley? 3. Do you think we should sacrifice some economic development to preserve nature?	1. Is the prevention of biodiversity loss a priority to be considered in development decisions? 2. What is the value of biodiversity to the economy of the valley? 3. Is biodiversity loss a global problem, national problem or a local problem?	1. What role can renewable energy play in providing energy for the local community? 2. Do you think the government is doing enough to encourage local energy production? 3. What more can the government do?
Technical capacity requirements (Technical resources capacity relates to the logistics necessary to address the components of technology that are needed for the implementation of solutions.)	1. Do you think we have the technology to adapt to the impact of climate change in this region? 2. What are examples of technology which will help us adapt to climate change? 3. What are the obstacles to adoption of these technologies 4. Would you be willing to promote and implement	1. Are there technologies which enable dual use in the region (example: Agrivoltaic)? 2. What technological advancements can be made which would make agriculture more competitive to land development?	1. Are there techniques in use in the valley to protect biodiversity? Examples? 2. What are the barriers to adoption of these techniques?	1. What percentage of energy used in the valley comes from renewables? 2. Do you have any personal experience with renewable energy systems? What was your experience? 3. What can be done to encourage the increase in renewable energy use in the valley?

	Nature-based Solutions in your work, to address climate change through mitigation and adaptation?			
Capacity factors	**Climate change**	**Competition between development and land conservation**	**Biodiversity**	**Renewable energy availability**
Institutional capacity requirements (Institutional capacity defines the components of the institutional framework that needs to be in place to provide the services.)	1. Which institutions are responsible for helping the valley adapt to climate change? 2. Are they doing enough? 3. What else should they be doing?	1. Are the current plans for development in the valley balanced between the economic need for growth and the need to conserve nature? 2. Who is making these decisions? 3. Is the public involved enough in the decision-making process? 4. Who speaks for nature?	1. Are existing institutions doing enough to preserve biodiversity? 2. Do existing plans for development in the valley consider protecting biodiversity? 3. What more should be done to protect biodiversity in the valley? 4. 4. Are you aware of institutional frameworks to plan and implement Nature-based Solutions to help address ecosystem degradation and biodiversity loss, through different interventions such as ecological restoration, green infrastructure, or implementing agroecological practices?	1. Who is responsible for promoting the use of renewable energy in the valley? 2. Do current regulations encourage local production of renewable energy? 3. What more should be done to promote renewable energy use in the valley?
Financial and economic capacity	1. What are the biggest economic challenges facing the valley?			

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requirements (Economic and financial capacity represents the financing of the services, the availability of loans, and the financial assets in the community.)	2. Do current financial institutions and government bodies provide enough financial tools to meet the economic and environmental challenges facing the valley.

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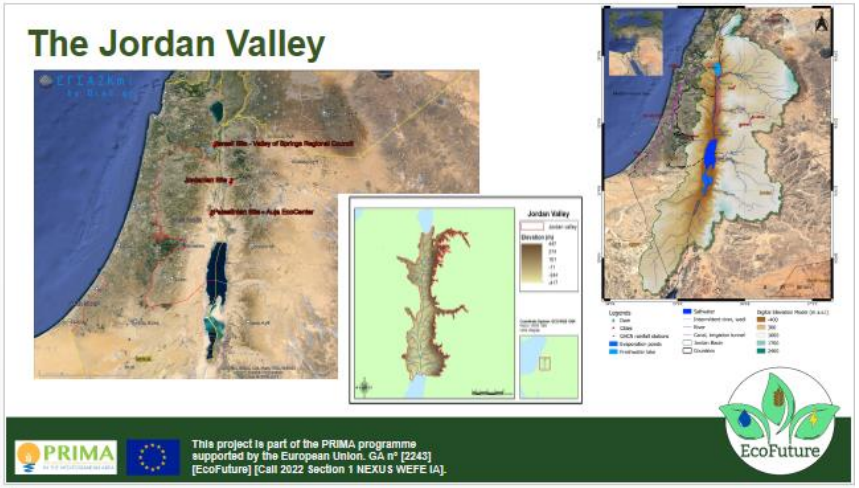
Appendix B – Presentation

1



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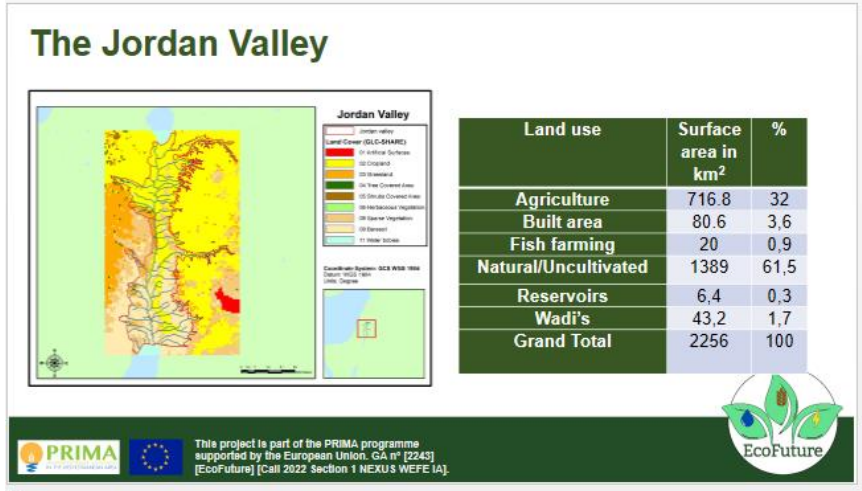
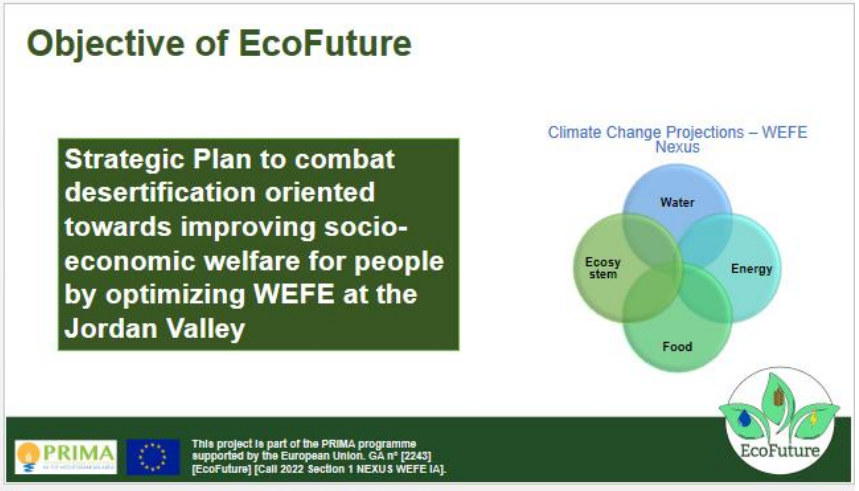


Land use	Surface area in km²	%
Agriculture	716.8	32
Built area	80.6	3,6
Fish farming	20	0,9
Natural/Uncultivated	1389	61,5
Reservoirs	6,4	0,3
Wadi's	43,2	1,7
Grand Total	2256	100

3



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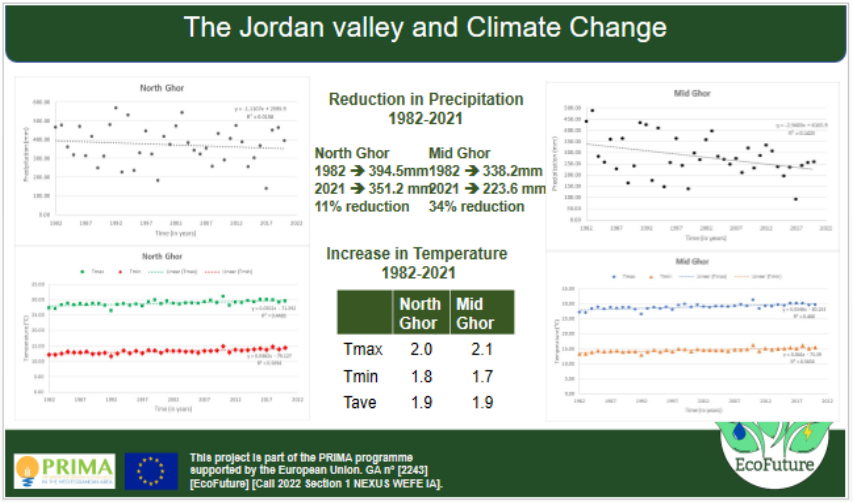
The Jordan valley and Climate Change
North Ghor
Mid Ghor
Reduction in Precipitation 1982-2021
North Ghor
1982 → 394.5mm
2021 → 351.2 mm
11% reduction
Mid Ghor
1982 → 338.2mm
2021 → 223.6 mm
34% reduction
Increase in Temperature 1982-2021
North Ghor
Mid Ghor
Tmax 2.0 2.1
Tmin 1.8 1.7
Tave 1.9 1.9
PRIMA
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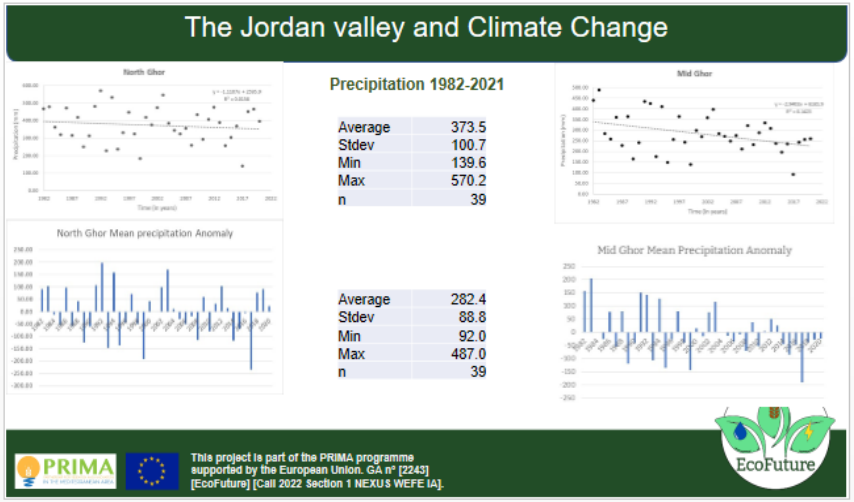
EcoFuture

5


The Jordan valley and Climate Change
North Ghor
Mid Ghor
Precipitation 1982-2021
Average 373.5
Stdev 100.7
Min 139.6
Max 570.2
n 39
North Ghor Mean precipitation Anomaly
Mid Ghor Mean Precipitation Anomaly
Average 282.4
Stdev 88.8
Min 92.0
Max 487.0
n 39
PRIMA
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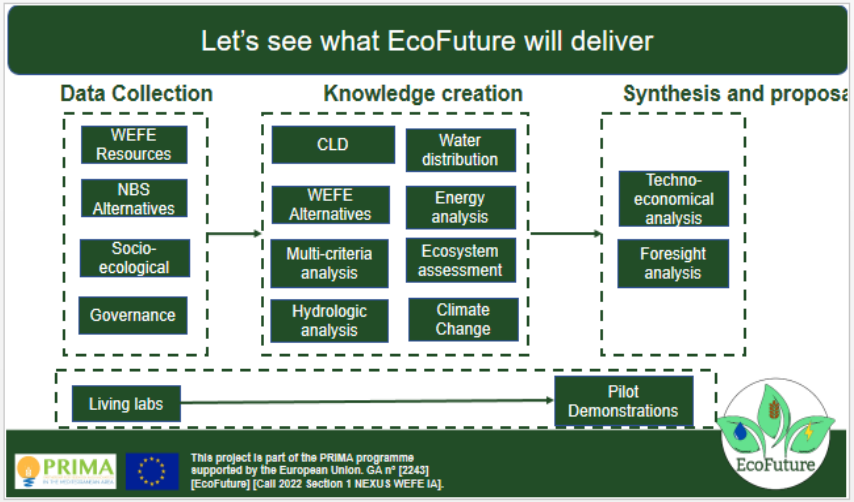
EcoFuture

6


Let's see what EcoFuture will deliver
Data Collection
Knowledge creation
Synthesis and proposa
WEFE Resources
NBS Alternatives
Socio-ecological
Governance
CLD
Water distribution
WEFE Alternatives
Energy analysis
Multi-criteria analysis
Ecosystem assessment
Hydrologic analysis
Climate Change
Techno-economical analysis
Foresight analysis
Living labs
Pilot Demonstrations
PRIMA
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EcoFuture

7


Overview of 1st Year's Results
PRIMA
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8

Mapping of WEFE Resources - Water

Supply	Unit	Israel	Palestine	Jordan
Irrigation water	Mcm/yr	134.84	32.80	206.42
Drinking water	Mcm/yr	7.09	6.40	23.62
Demand				
Irrigation water	Mcm/yr	134.84	182.00	400.00
Drinking water	Mcm/yr	7.09	10.00	26.00
Total Supply		141.9	39.2	230.0
Deficit		0.0	-153.0	- 196.0

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9

Mapping of WEFE Resources – Land use

Land use	Unit	Israel	Palestine	Jordan
Agriculture	Km2	249	173	452
Built Area	Km2	30	25	45
Fish farming	Km2	17	0.3	0.7
Natural/ Uncultivated area	Km2	26	671	810
Reservoirs	Km2	2	0.3	6
Wadi deposits	Km2		14	24
		324	884	1337

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10

Mapping of WEFE Resources – Water Use

	Unit	Israel	Palestine*	Jordan
Agricultural Area	Km2	249	173	331.4
Irrigated Agriculture	Km2	176	91	304.7
Irrigation water	Mm3/yr	67.8	32.8	206.4
Irrigation Rate	mm/dunum	385	360	377
Drinking water	Mm3/yr	7.1	6.4	23.6
Population	cap	60000	70,000	260000
Water use per capita	L/d/cap	324	205	249

Total water use = 411 Mcm/yr
Aquaculture = 67 Mcm/yr (16%)

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Mapping of WEFE Resources – Sources of Water

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Mapping of WEFE Resources – Energy

	Unit	Israel	Palestine	Jordan
Supply	GWh/yr	382	300	23,654
Demand	GWh/yr	382	?	23,654

- **Deficit in Palestine**
- **The supply in the three territories is meeting the current demand, however, the annual increase in electricity demand in the area and the three countries is increasing at a very fast pace necessitating strategies that will accomplish sufficient increases in energy supply that will cover the future demand**

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13

Mapping of WEFE Resources – Food

Agricultural land use, ha			
	Israel	Palestine	Jordan
Fodder Crops		53	400
Field Crops	46000	215	2241
Vegetables	11430		16602
Green Houses	928	441	7000
Fruit Crops	13120	110	28301
Others	410		29030
Total	71888		825
83574			

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14

Mapping of WEFE Resources – Food

	Actual Yield ton/dunum	Max Yield ton/dunum
Greenhouse vegetables	4.7	10.0
Summer Vegetables	2.0	8.0
Winter Vegetables	4.2	
Citrus trees	2.6	4.0

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Environmental Drivers-Pressures-Impacts

- Population growth
- Climate change
- Land use change
- Pollution

Drivers → Pressures → State → Impacts → Response

- Intensive agriculture
- Livestock
- Aquaculture
- Tourism
- Climate change
- Geologic setting
- Population/migration

- Surface water flow decline
- Groundwater depletion
- Soil degradation
- High salinity
- Erosion and suspended sediments
- Wastewater pollution and pollution from aquaculture and agriculture
- Loss of biodiversity

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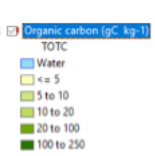
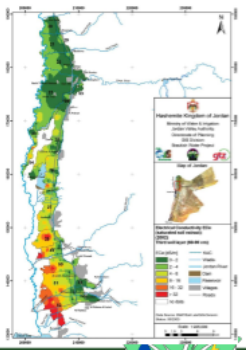
Environmental Drivers-Pressures-Impacts

Soil and Terrain (SOTER) Database for Jordan



Salinity map in Redouane Choukr-Allah, 2021 (data from Ammari et al., 2013)



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17

Mapping of Governance Structures

Key stakeholders – Jordan

Water **Energy** **Food** **E**

WEFE Sectors	Water	Energy	Food	Ecosystem
Jordan	15	14	4	5
Israel	8	7	10	3
Palestine	10	8	8	3

95 stakeholders

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18

Mapping of Governance Structures

Policy Frameworks- Water Sector

Jordan

- Oslo Accords (1993)
- Jordan-Israel Peace Treaty (1994)
- International Agreements.
- National Water Strategies

Israel

- The Law for Water Measurement (1955)
- The Law for Supervision of Water Drillings (1955)
- The Law for Drainage and Flood Prevention (1957)
- The Water Law (1959)
- The Municipal Water and Sewage Incorporation Law (2001)
- Sewage Effluents Quality Standards and Sewage Treatment Rules (2010)
- Sanitary Quality of Drinking Water Law (2013).

Pales

- Oslo Accords (1993)
- Water Law (2014)
- Decree No. 14 (2014)

Policies are not aligned

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Mapping of Governance Structures

Challenges- Water Sector

Jordan

- Availability of water in the Jordan river
- Water demand increases
- Competition among sectors
- Infrastructure – dam development (transboundary issues)

Israel

- "Balanced budget" Act
- Water pricing impacts
- Infrastructure

Palestine

- Fragmented and heterogenous water sector
- Infrastructure investments
- Water availability

Challenges are not aligned

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Jordanian Pilot Site – Deir Alla

- Water harvesting
- Groundwater desalination unit
- PV energy supply
- Use for irrigation – reduced irrigation
- Soil fertility improvement – organic matter addition

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21

Palestinian Pilot Site – Marj Najeh- Jericho District

Plan Layout For Proposed Sewer Collection System

- Treated waste water reuse
  - Sewage collection
  - Compact wastewater treatment unit
- Groundwater desalination unit
- PV energy supply
- Use for irrigation – reduced irrigation

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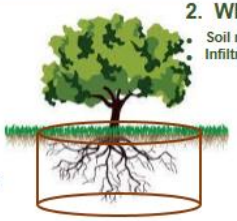
22

Focus on Farmers - Optimize Irrigation with NBS

1. Rules of irrigation

- Replenish soil moisture of the roots only
- Don't let water go below the root zone
- Acknowledge that the roots are very efficient to transfer moisture to the planyt

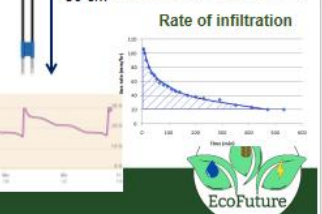
Volume of soil (for avocado a cylinder with radius of 1.5-1.7 m and depth 0.5 m)



2. What do we need

- Soil moisture meter
- Infiltration experiment

Infiltration experiment



30 cm

Rate of infiltration

3. What do we get

- The rate of irrigation
- The duration of irrigation

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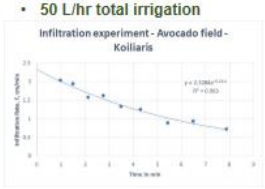
23

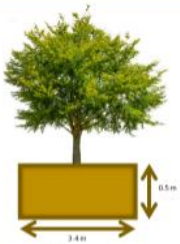
Jordanian Pilot Site – Deir Alla

Drip irrigation

- Pipe around the tree – 1 m from the trunk
- 24 locations of drip
- 2 L/hr per drip
- 50 L/hr total irrigation



Fc = Infiltration rate= 12.5 cm/hr
Kf = Hydraulic conductivity = 12.7 cm/hr



Irrigation
2020 ➔ 8550 L/tree
2021 ➔ 8660 L/tree
2022..➔ 5100 L/tree

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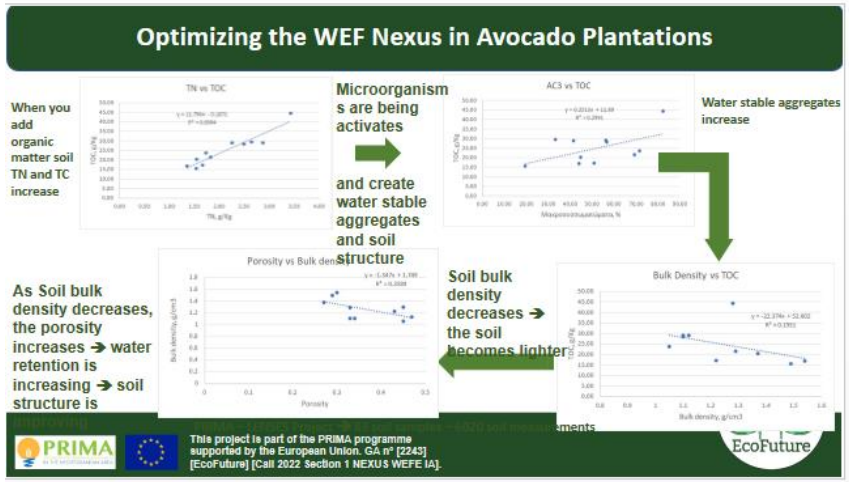
24


Optimizing the WEF Nexus in Avocado Plantations
When you add organic matter soil TN and TC increase
Microorganisms are being activates
and create water stable aggregates and soil structure
Water stable aggregates increase
As Soil bulk density decreases, the porosity increases ➔ water retention is increasing ➔ soil structure is
Soil bulk density decreases ➔ the soil becomes lighter
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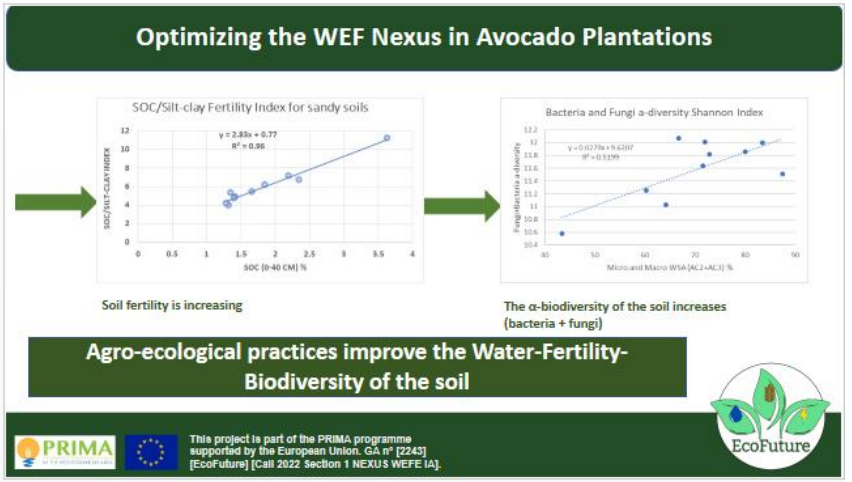
25


Optimizing the WEF Nexus in Avocado Plantations
SOC/Silt-clay Fertility Index for sandy soils
Bacteria and Fungi a-diversity Shannon Index
Soil fertility is increasing
The α-biodiversity of the soil increases (bacteria + fungi)
Agro-ecological practices improve the Water-Fertility-Biodiversity of the soil
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26


Stakeholder Engagement
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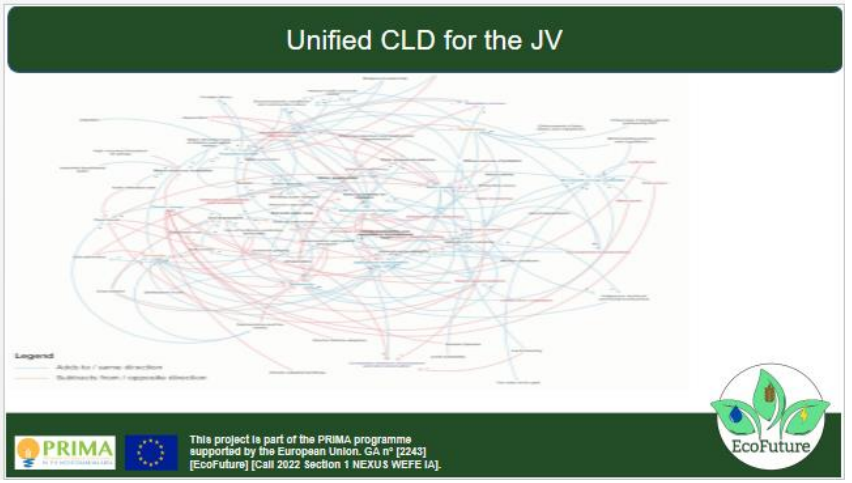
Unified CLD for the JV
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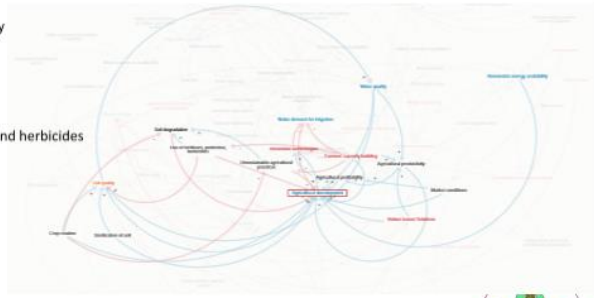
Challenge: Agricultural development

Affected by:
- Water quality
- Water demand for irrigation
- Renewable energy availability
- Market conditions
- Agricultural productivity
- Crop rotation
- Soil quality
- Soil degradation
- Use of fertilizers, pesticides and herbicides
- Farmer's capacity to adapt
- Innovative technologies

Impacting:
- Agricultural profitability



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29

Prioritization of Challenges

	Jordan	Israel	Palestine
Highest priorities	1) Water quality 2) Water demand for irrigation 3) Soil quality 4) Agricultural development	1) Climate change 2) Competition between development and land conservation 3) Biodiversity 4) Renewable energy availability	1) Water demand for irrigation 2) Water quality 3) Agricultural development 4) Renewable energy availability
Lesser priorities	5) Biodiversity 6) Climate change 7) Renewable energy availability 8) Governance	5) Population growth and Sanitation services 6) Agricultural development 7) Water quality	5) Climate change 6) Biodiversity
Last priority	9) Population growth	8) Water demand for irrigation	7. Population growth

30

Community Capacity Assessment Workshop

- Technical, institutional, human resources, financial and energy capacities
- Understand barriers and capacity weaknesses
- Identify ways to overcome barriers
- Training activities

Priorities of challenges
- Water quality
- Water demand for irrigation
- Soil quality
- Agricultural development
- Renewable energy availability

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31

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32

Appendix C – Logistics of the Jordanian/Palestinian Joint workshop

Jordanian/Palestinian Joint workshop agenda

Day 1: July 1, 2024	
Time	Activity
09:00 - 10:00	Eco-Future Project Members Meeting
Living lab workshop	
10:00 - 10:15	Opening Remarks: Welcoming Guests and Highlighting the Objectives of the Workshop.
10:15 – 10:45	Introduction of Project Achievements
10:45 - 11:00	Coffee Break
11:00 – 1:00	Discussion of challenges and solutions (participants to be divided into 2 groups).
1:00 - 1:15	Prayer time and coffee break
1:15 – 2:00	Presentations from the two groups
2:00	Lunch
Day 2: July 2, 2024	
09:00 – 9:45	Departure to Deir Alla (National Agricultural Research Center Station)
9:45 - 10:30	Visit to the Demo Site and Note-taking
10:30 - 11:40	Welcoming Remarks by Eng. Motassem Khreasat, Manager of Deir Alla Station
10:40 - 11:30	Presentation on the wastewater treatment plant at the Palestinian site by Eng. Ammar Al Kokhn and a second presentation on the Jordanian pilot Site Accomplishments and Details by Eng. Mohammed Mudabber
11:00 – 4:30	Departure from Deir Alla and Visit Ajloun Castle and Lunch at Oak restaurant in Ajloun forest reserve

Participants list

No.	Invited Name	Position	Status
	Jordanian Group		
1	Yousef Mousa Abu Eyadeh	Farmer, Karameh (Water User Association)	Attended
2	Mohamad Abu Jagleif	Farmer, Karameh	Attended
3	Suleiman Ahmad Mohamad	Farmer, Karameh	Attended
4	Raed Mohamad Alawneh	Farmer, Karameh	Attended
5	Shayma Moh'd Mkaimer	Farmer, Deir Alla	Attended
6	Senan Fayez AlAdwan	Farmer, South Shuneh	Attended
7	Mahmoud Saleh AlDabbas	Farmer, Karameh (Water User Association)	Attended
8	Eng. Ammar Tamarneh (Mira)	Jordan University of Science and Technology, (Karameh, Mira cooperative)	Attended
9	Ala'a Omar Al-Adwan	Farmer, South Shouna	Attended
10	Dr. Abeer Albalwneh	NARC, Project coordinator-Jordan	Attended
11	Eng. Safa'a Bahjat Jaafreh	NARC, Project team member	Attended
12	Eng. Mutasem Alkhraisat	NARC, Project team member	Attended
13	Eng. Ahmad Moh'd Alalwan	NARC, Project team member	Attended

14	Eng. Mohamad Mudabber	NARC, Project team member	Attended
15	Dr. Luma Hamdi	NARC, Project team member	Attended
16	Dr. Maram al-Abbadi	NARC, Project team member	Attended
17	Dr. Suleiman Halasah	i.GREENs, Project coordinator - Jordan	Attended
	Palestinian Group		Attended
18	Essam Mere'e	Farmer	Attended
19	Ismael Ayed	Farmer	Attended
20	Sami Mere'e	Farmer	Attended
21	Ziad Masoud	Farmer	Attended
22	Ayed Ahmad	Damour	Attended
23	Eng. Sayel Jebreen	Ministry of Economy	Attended
24	Eng. Adel Yassin	Water authority	Attended
25	Dr. Shaddad Attili	Damour	Attended
26	Ashraf Ajrami	Damour	Attended
27	Eng. Ammar Al Kokhn	Damour	Attended

Appendix D – Logistics of the Israeli workshop

Participant list

No.	Invited Name	Position	Status
1	David Lehrer	AIES, Project team member	Attended
2	Jozsef Kadar	AIES, Project team member	Attended
3	Evie Leviten Lawton	AIES, Project team member	Attended
4	Shlomo Wald	TAW, Project team member	Attended
5	Yoram Karin	Former Regional Council Chair, incoming Head of Fish Growers Association	Attended
6	Guy Rubenstein	Ministry of Agriculture	Attended
7	Hanoch Glasner	Eden Farm	Attended
8	Barak Goldshmidt	Innovalley	Attended
9	Amos Benun	Integrator for the fishing industry, Fish Farming Organisation	Attended
10	Shiri Firdman	Southern Jordan Valley Drainage authority	Attended
11	Elor Levi	Manager of the Division for Environmental Quality for the Valley of the Springs Local Council	Attended
12	Ashchar Batzer	Operational manager of the Springs Park and works with farmers from the area.	Attended
13	Bar Benyamin	Ministry of Environment and Infrastructure, M.A student for Environment and Sustainability	Attended
14	Naor Kanfi	Ministry of Environment and Infrastructure, M.A student for Environment and Sustainability	Attended

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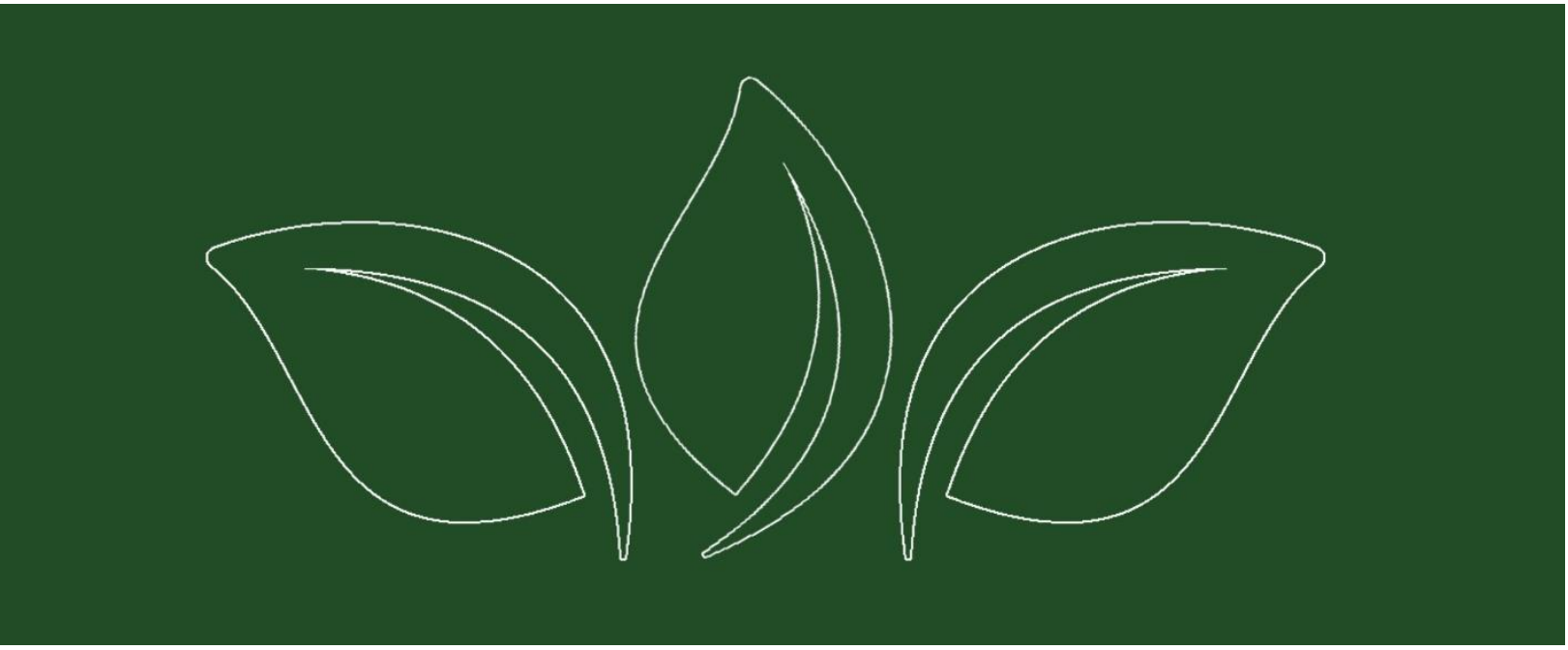
Project Coordinator

Project Partners



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