



Workshop Report

“Ecosystem Restoration to reduce soil erosion in Amman Zarqa Basin”.
Making people part of the ecosystem restoration

Submitted by : INWRDAM

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Introduction

The workshop titled "Ecosystem Restoration to Reduce Soil Erosion and Dam Siltation" focused on the Amman Zarqa Basin in Jordan. This event, held from March 4th to 7th, 2024, at the facilities of INWRDAM (Inter-Islamic Network on Water Resources Development and Management) and NARC (National Agricultural Research Centre), aimed at forming a robust partnership for the landscape restoration around King Talal Dam. The initiative sought to address the critical issue of dam siltation which is impacting the dam's operational efficiency and storage capacity.

Objectives

The primary goal was to foster a collective approach to mitigate siltation at King Talal Dam and enhance ecological, social, and financial benefits through sustainable practices. Specific objectives included:

- Enhancing knowledge and leadership on ecosystem services.
- Creating a strong network among stakeholders to improve cooperation.
- Developing a unified direction for current and future restoration initiatives.
- Crafting actionable commitments towards a watershed master plan.

Workshop Structure and Content

The workshop employed a Labs methodology to ensure active participation and knowledge exchange among attendees. It spanned four days, each structured to progressively build understanding and develop practical outcomes.

Summary:

The four-day Ecosystem Restoration Workshop focused on addressing soil erosion and dam siltation in the Amman Zarqa Basin, Jordan, through comprehensive theoretical sessions, practical exercises, and field visits. The workshop aimed to foster a robust understanding of ecosystem challenges and cultivate a network of informed stakeholders equipped to implement sustainable restoration strategies.

Key Takeaways from Each Day:

Day 1: Introduction and Theoretical Foundations

- **Presentations:** The day featured detailed talks on the current state of dam siltation in Jordan, the integrated approach to ecosystem restoration at Al Majedyeh site, and essential ecosystem restoration policies and financing.
- **Outcomes:** Participants gained foundational knowledge about the severity of ecological issues and the potential of nature-based solutions, setting the stage for deeper technical explorations.

Day 2: Technical Deep Dive and Youth Engagement

- **Activities:** Intensive sessions on GIS and remote sensing, along with youth presentations on innovative tools for ecosystem restoration, highlighted modern techniques and the role of technology in ecological management.

- **Outcomes:** The exploration of advanced technological tools and innovative methods introduced participants to contemporary approaches that complement traditional restoration practices.

Day 3: Field Visits and Practical Application

- **Visits:** Real-world observations at North Zarqa, Balama Village, and Rehab Village where participants saw the impacts of environmental degradation and community-based restoration efforts firsthand.
- **Outcomes:** These visits crystallized the discussions from the first two days, allowing participants to see the real-world application of concepts discussed and understand the local context deeply.

Day 4: Synthesis and Policy Engagement

- **Activities:** Problem tree analyses facilitated a structured understanding of specific ecological issues. Concluding presentations to policymakers synthesized the insights gained and proposed actionable solutions.
- **Outcomes:** The final day bridged theory and practice, fostering dialogue between participants and policymakers to craft informed, feasible, and sustainable restoration strategies.

Overall Workshop Achievements:

- **Enhanced Understanding:** Participants from various backgrounds gained a holistic and nuanced understanding of ecosystem degradation issues and restoration opportunities.
- **Community and Stakeholder Engagement:** The workshop emphasized the importance of involving local communities and stakeholders at all levels, ensuring that restoration efforts are community-driven and sustainable.
- **Policy Recommendations:** Presentations to policymakers and stakeholders culminated in concrete recommendations for ecosystem restoration, particularly concerning innovative tools and community partnerships.
- **Network Building:** Establishment of a community of practice among participants to support ongoing dialogue and collaboration post-workshop.

Way Forward:

1. **Comprehensive Basin-Level Study:** Recommend conducting a detailed study across the Amman Zarqa Basin to identify soil erosion hotspots. This study should integrate advanced GIS and remote sensing technologies to map erosion severity and dynamics, which will inform targeted, effective restoration strategies and interventions.
2. **Implementation of Pilot Projects:** Immediate commencement of pilot projects in identified areas like Balama and Rehab Village to apply and adjust the conceptual models developed.
3. **Policy Development and Support:** Leveraging the workshop's outcomes to advocate for and develop policies that facilitate ecosystem restoration at national and regional levels.
4. **Continuous Learning and Adaptation:** Establishing mechanisms for ongoing learning, feedback, and adaptation of restoration strategies based on emerging outcomes and evolving scientific understanding.

5. **Sustained Engagement and Capacity Building:** Continuing to engage stakeholders through further training, workshops, and collaborative projects to build local capacity for long-term ecosystem management.

Impact

The Ecosystem Restoration Workshop successfully set the stage for actionable strategies and fostered a collaborative environment among diverse stakeholders. It highlighted the critical need for integrated approaches that leverage both innovative technologies and traditional knowledge, underscoring the importance of community involvement and adaptive management in ecosystem restoration efforts. As participants and policymakers move forward, the insights and connections developed during this workshop will serve as foundational elements for future ecological restoration initiatives.

Participant Demographics

- **Total Participants:** 43 (33 participants + 10 experts)
- **Gender Distribution:** 21 females, 22 males
- **Youth Participation:** 46%
- **Local Community Representation:** 15%
- **Student Participation:** 14%

Stakeholder Participation

Entity / Sector	Number of Participants
Jordan Valley Authority (JVA)	3
Ministry of Water and Irrigation (MWI)	2
Ministry of Agriculture (MoA)	3
National Agricultural Research Center (NARC)	3
Municipalities	2
Farmers	5
Community-Based Organizations (CBOs) & NGOs	5
Private Sector	1
Youth and University Students	11

Visual Diagrams Explanation

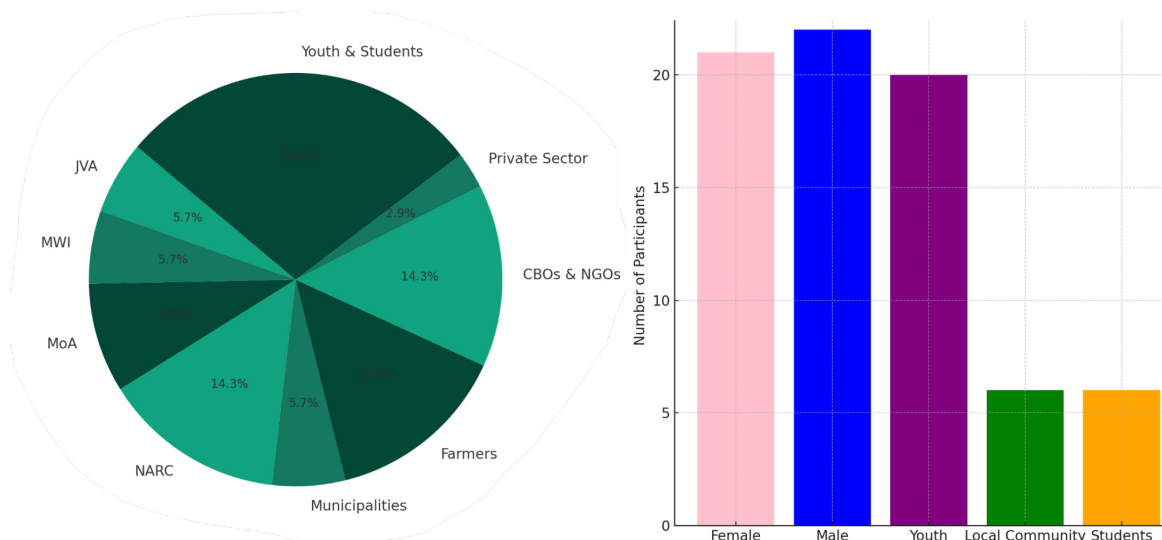
1. Participant Distribution by Sector (Pie Chart):

- This chart illustrates the proportional representation of participants from different sectors. Sectors with a higher number of participants, such as Youth and University Students, Farmers, and CBOs & NGOs, are highlighted, showing significant engagement from these groups.

2. Participant Demographics (Bar Chart):

- The bar chart displays the count of participants by demographic categories. It highlights the gender balance and the representation of youth, local community members, and students in the workshop.

These diagrams help in visualizing the distribution and diversity of stakeholder participation, crucial for assessing the workshop's reach and impact.



- **Engagement Diversity:** The workshop successfully engaged a diverse group of stakeholders, crucial for the comprehensive development of the watershed master plan.
- **Youth Involvement:** High youth participation suggests strong future engagement and the importance of integrating younger perspectives in environmental initiatives.
- **Sector Collaboration:** The varied representation from governmental bodies, NGOs, and the private sector provides a strong foundation for collaborative action.

Detailed activity report

Day 1 Presentations:

Dam siltation in Jordan

Presenter: Dr. Elias Salameh, Head of Dam Safety Committee at Jordan Valley Authority (JVA)

Key Points of the Presentation:

1. Overview of Dam Siltation in Jordan:

- **Issue Highlight:** Significant siltation in Jordan's dams, notably King Talal Dam, which has experienced more than a 20% reduction in storage capacity.
- **General Impact:** Reduced capacity affects water availability for agricultural and domestic uses across Jordan.

2. Causes of Siltation Identified:

- **Natural Erosion:** Normal environmental processes contributing to sediment accumulation.
- **Agricultural Practices:** Poor agricultural methods increase soil erosion, particularly in dam catchments.
- **Deforestation:** Removal of vegetation exacerbates soil erosion.
- **Urbanization:** Development activities disturb land surfaces, increasing runoff and sediment flow.
- **Climate Change:** More frequent and intense rainfall leads to higher runoff volumes, carrying more sediment into dams.

3. Impacts of Siltation:

- **Storage Capacity:** Ongoing siltation reduces the effective water storage capacity of dams, critical for Jordan's water management.
- **Maintenance Costs:** Increased financial burden due to the need for frequent dredging and sediment management.
- **Water Quality:** Accumulated sediments degrade water quality by introducing pollutants.

4. Current Evaluations and Data:

- **Data Presentation:** Dr. Salameh used recent evaluations, graphs, and satellite imagery to detail the sediment accumulation, emphasizing the urgent need for effective management strategies.

5. Mitigation Strategies:

- Discussed but not detailed in the summary provided, likely includes recommendations for reducing upstream erosion, improving agricultural practices, and possibly engineering solutions like dredging and the construction of sediment traps.

Impact

Dr. Salameh's presentation effectively highlighted the critical issue of dam siltation in Jordan, detailing its causes, impacts, and the urgent need for comprehensive strategies to mitigate this problem to ensure sustainable water resources management.

Introduction to Ecosystem Restoration – Al Majedyeh Case Study

Presenter: Eng. Mira Haddad, Senior Researcher at ICARDA

Key Points:

1. Project Overview:

- **Context:** The Al Majedyeh site showcases integrated nature-based solutions for ecosystem restoration in arid regions.
- **Goals:** Enhance green cover and soil stability, involving local communities to ensure sustainability.

2. Restoration Techniques:

- **Vegetation and Soil:** Planting native species and employing soil conservation techniques such as contour plowing.
- **Water Management:** Implementing water harvesting techniques to improve water availability.

3. Community Engagement:

- **Local Participation:** Direct partnership with local communities for project execution and maintenance.
- **Capacity Building:** Educational initiatives to sustain restoration efforts.

4. Impacts and Outcomes:

- **Ecological:** Improved biodiversity and ecosystem services, including water regulation.
- **Socio-economic:** Enhanced local livelihoods and potential for increased tourism due to improved landscape aesthetics.

5. Concluding Insights:

- **Scalability:** Techniques used are adaptable and can be replicated in similar ecological zones.
- **Integrated Approach:** Success attributed to the holistic integration of various restoration methods tailored to local conditions.

Impact

Eng. Mira Haddad demonstrated that Al Majedyeh is an effective model for ecosystem restoration, highlighting the importance of community involvement and integrated, nature-based solutions. The project offers scalable practices beneficial for similar arid areas.

Ecosystem Restoration Policies:

Presenter: Eng. Amjad Abdulqader, International Union for Conservation of Nature (IUCN)

Key Points:

1. Policy Overview:

- **Context:** Discussion of key international and Jordanian policies aimed at promoting ecosystem restoration.
- **Objective:** To highlight policies that support the enhancement and protection of ecosystems within Jordan and globally.

2. Jordanian Policies:

- **National Strategies:** Details on Jordanian policies that facilitate ecosystem health, including legislation and government initiatives.
- **Local Successes:** Examples of successful local implementations that have positively impacted ecosystem restoration and conservation.

3. International Frameworks:

- **Global Cooperation:** Overview of international agreements and frameworks that Jordan participates in to align local efforts with global conservation goals.

4. Policy Impact and Effectiveness:

- **Ecological Benefits:** How these policies have led to improved ecological outcomes through structured restoration projects.
- **Challenges:** Addressing gaps and challenges in current policy frameworks to enhance effectiveness.

5. Best Practices and Recommendations:

- **Adoption of Best Practices:** Suggestions for integrating successful international practices into Jordan's national strategy.
- **Policy Improvement:** Recommendations for policy adjustments to better support comprehensive ecosystem restoration efforts.

Impact

Eng. Amjad Abdulqader emphasized the importance of robust ecosystem restoration policies, both at a national and international level. He highlighted successful cases and provided recommendations for leveraging global best practices to strengthen Jordan's policy framework, aiming to achieve better ecological and socio-economic outcomes from restoration initiatives.

Ecosystem Financing and Investment:

Presenter: Ms. Dina Abu Areedah, Representative of the Private Sector

Key Points:

1. **Financial Strategies:**
 - **Scope:** Overview of financing mechanisms for ecosystem restoration, emphasizing the role of economic incentives.
 - **Objective:** To explore sustainable investment opportunities that bolster local ecosystems.
2. **Economic Value:**
 - **Income Generation:** Discussion on how restored ecosystems can serve as economic assets, providing financial returns through activities like water harvesting.
3. **Private Sector Role:**
 - **Partnerships:** Importance of public-private partnerships in funding restoration projects.
 - **Investment Potential:** Potential for private sector investment in ecosystem services as profitable ventures.
4. **Recommendations:**
 - **Policy Support:** Advocacy for policies that encourage private investment in ecosystem restoration.
 - **Community Involvement:** Emphasis on economic empowerment of local communities through direct involvement in projects.

Impact

Ms. Dina Abu Areedah highlighted the critical role of financial strategies in ecosystem restoration, pointing to the private sector's potential to drive economic and ecological benefits through strategic investments and partnerships. She recommended enhanced policy support to facilitate these investments and maximize community gains.

Applying the Himma Concept:

Presenter:

Eng. Nawras Al Jazzi, Senior Researcher at the National Center for Research and Development

Key Points:

1. Himma Concept Overview:

- **Definition:** Introduction of the Himma system, a traditional land management practice in Jordan used for communal and environmental stewardship.
- **Relevance:** Emphasis on its applicability for modern ecosystem restoration efforts.

2. Implementation Examples:

- **Local Applications:** Description of successful Himma implementations, particularly in the Amman Zarqa Basin, showcasing how these practices have been modernized to enhance ecosystem health.

3. Benefits and Challenges:

- **Advantages:** Improved local ecosystem health and increased community involvement in sustainable practices.
- **Obstacles:** Challenges in integrating traditional practices with modern restoration techniques and policy frameworks.

4. Recommendations:

- **Policy Integration:** Suggestions for incorporating Himma concepts more extensively into national ecosystem management policies.
- **Community Empowerment:** Advocacy for greater community engagement in ecosystem restoration using the Himma framework.

Impact

Eng. Nawras Al Jazzi advocated for the revitalization of the Himma concept within Jordanian ecosystem restoration, highlighting its potential to blend traditional knowledge with modern practices for improved ecological and social outcomes. He recommended stronger policy support and community-driven approaches to fully realize these benefits.

Day 2 Presentations:

Case Studies of Ecosystem Degradation and Restoration:

Presenter:

Dr. Jamal Sawan, University of Jordan

Key Points:

1. Ecosystem Challenges:

- **Overview:** Examination of ecosystem degradation in Jordan, highlighting critical areas and factors contributing to environmental decline.
- **Specific Case:** Focus on the Muwaqqar site as an illustrative example of degradation due to soil erosion and poor land management practices.

2. Restoration Efforts:

- **Muwaqqar Initiatives:** Detailed presentation of restoration strategies implemented at Muwaqqar, including nature-based solutions like vegetation buffers and erosion control measures.
- **Outcome Benefits:** Discussion on the ecological improvements observed post-restoration, such as increased biodiversity and stabilized soil.

3. Lessons Learned:

- **Best Practices:** Insights into effective strategies and approaches for ecosystem restoration derived from the case studies.
- **Scalability:** Considerations on how these practices can be adapted and scaled to other similar regions facing ecological challenges.

4. Policy Recommendations:

- **Enhanced Support:** Calls for greater governmental and international support for ecosystem restoration projects.
- **Integration of Local Knowledge:** Emphasis on the importance of incorporating local and indigenous knowledge into restoration practices.

Impact

Dr. Jamal Sawan provided a comprehensive review of ecosystem degradation and restoration, using the Muwaqqar site as a case study to illustrate successful interventions and the tangible benefits of such initiatives. He advocated for policy enhancements and broader application of proven restoration techniques to mitigate ecological degradation across Jordan.

GIS and Remote Sensing for Ecosystem Restoration:

Presenter: Eng. Lubna Mahasneh, National Agricultural Research Center (NARC)

Key Points:

1. Technology Overview:

- **Purpose:** Introduction to the use of GIS (Geographic Information Systems) and remote sensing technologies in monitoring and restoring ecosystems.
- **Tools Employed:** Specific mention of Sentinel satellite data for land use monitoring and erosion modeling.

2. Applications in Restoration:

- **Monitoring Changes:** Utilization of remote sensing to track land use changes over time and assess the effectiveness of restoration efforts.
- **Predictive Modeling:** How GIS tools help predict erosion and other ecological impacts under various scenarios.

3. Benefits of Technology:

- **Accuracy and Efficiency:** Improved data precision and operational efficiency in ecosystem management tasks.
- **Broad Coverage:** Ability to monitor large and inaccessible areas with minimal physical intrusion.

4. Implementation Challenges:

- **Technical Barriers:** Complexity of technology and need for specialized training.
- **Data Integration:** Challenges in integrating satellite data with local ecological data for comprehensive analyses.

5. Strategic Recommendations:

- **Capacity Building:** Enhance local expertise in GIS and remote sensing through targeted training programs.
- **Policy Support:** Develop policies that integrate technology into standard ecosystem management practices.

Impact

Eng. Lubna Mahasneh highlighted the critical role of GIS and remote sensing in ecosystem restoration, emphasizing their value in precise monitoring and predictive modelling of ecological changes. She recommended increased investment in technological capacity and policy adjustments to fully leverage these tools for sustainable ecosystem management.

Google Earth Professional – A Tool for Ecosystem Monitoring:

Presenter: Eng. Doaa Abu Hammour, National Agricultural Research Center (NARC)

Key Points:

1. Tool Introduction:

- **Purpose:** Overview of Google Earth Professional as a powerful, free tool for ecosystem monitoring.
- **Features:** Highlighted capabilities such as historical imagery comparison, which are critical for observing changes in ecosystems over time.

2. Applications in Ecosystem Monitoring:

- **Historical Analysis:** Utilization of Google Earth to track changes in the Amman Zarqa basins over the last 30 years.
- **Land Use and Planning:** Assisting in land management and planning decisions by providing detailed, up-to-date geographical data.

3. Benefits of Google Earth Professional:

- **Accessibility:** Easy access to detailed satellite imagery and historical data sets for a broad audience, including researchers and the general public.
- **User-Friendly:** Intuitive interface that allows users to easily navigate and extract needed geographical information.

4. Challenges and Limitations:

- **Resolution Constraints:** While useful, the resolution and update frequency of imagery may not meet the needs for all types of ecological monitoring.
- **Data Integration:** Issues in seamlessly integrating Google Earth data with other GIS data sources for complex ecological analyses.

5. Strategic Recommendations:

- **Enhanced Training:** Suggests increased training for local stakeholders on utilizing Google Earth Professional effectively for environmental monitoring.
- **Collaborative Use:** Encourages the integration of Google Earth with other GIS tools to maximize ecological monitoring and restoration efforts.

Impact

Eng. Doaa Abu Hammour advocated for the use of Google Earth Professional as an effective tool for ecosystem monitoring, particularly highlighting its utility in historical ecological analysis and land use planning. She recommended broader adoption and enhanced training to fully exploit this technology in ecosystem management practices.

Youth Presentation on Innovative Ecosystem Restoration Tools:

Presenters: Water Harvesting Youth Council

Key Points:

1. **Introduction to Innovative Tools:**

- **Purpose:** Overview of new and innovative tools designed to enhance ecosystem restoration efforts, particularly in combating soil erosion and promoting vegetation.
- **Tools Highlighted:** Geowebbs, geocells, erosion control blankets/mats, coir logs, seed bombs, and the Cocoon system for tree planting.

2. **Tool Descriptions and Applications:**

- **Geowebbs and Geocells:** Used to stabilize soil on slopes and prevent erosion.
- **Erosion Control Blankets and Mats:** Deployed to protect newly planted areas from erosion and promote vegetation growth.
- **Coir Logs:** Employed along streambanks and shorelines to stabilize soil and encourage plant growth.
- **Seed Bombs:** Simple means for seeding large areas with native plants, enhancing biodiversity.
- **Cocoon Planting System:** Innovative tree planting method that ensures young plants survive in arid conditions by providing sustained water supply.

3. **Benefits of These Tools:**

- **Environmental Impact:** Each tool offers specific benefits in terms of reducing erosion, enhancing soil health, and increasing plant survival rates.
- **Scalability and Accessibility:** Tools are designed to be easy to use and scalable across different ecosystems and restoration projects.

4. **Challenges and Limitations:**

- **Cost and Accessibility:** Some tools, while effective, may be cost-prohibitive for widespread use without subsidies or support.
- **Technical Training:** Effective deployment of these tools often requires some level of technical knowledge and training.

5. **Recommendations for Implementation:**

- **Community Engagement:** Engage local communities in the deployment of these tools to foster ownership and ensure sustainability.
- **Integration with Traditional Practices:** Combine innovative tools with traditional restoration practices for more comprehensive ecosystem management.

Day 3 Field Visits:

Venues: North Zarqa, Balama Village, and Rehab Village

1. Visit to North Zarqa:

- **Focus:** This site represents an area with very high soil erosion, which has created significant ecological and community challenges.
- **Activities:**
 - **Community Interaction:** Participants engaged with the local community to discuss the impacts of water harvesting and the community conflicts it has generated. Some community members are in favor of water harvesting for fodder production, while others are concerned about safety risks to children traveling across these areas.
 - **Nature-Based Solutions Observation:** The group explored various nature-based solutions implemented locally to protect the soil and manage water effectively.
- **Learning Outcomes:**
 - Participants observed firsthand the effects of conflicting land use priorities on ecosystem restoration and community safety.
 - Discussions covered the balance between agricultural needs and ecological conservation, emphasizing community-led solutions.

2. Visit to Balama Village:

- **Focus:** Examination of degraded ecosystems due to climate change and human activities, specifically massive mining operations.
- **Activities:**
 - **Observation of Degradation:** Participants saw the impact of extensive building stone mining on soil erosion and overall ecosystem degradation.
 - **Discussion with Locals:** Interaction with local farmers revealed ongoing agricultural practices that exacerbate the degradation, such as deep soil disturbances.
- **Learning Outcomes:**
 - Insight into how industrial activities like mining drastically alter the landscape and contribute to ecological issues.
 - Consideration of restoration strategies that can be employed in heavily modified environments to rehabilitate and stabilize the ecosystem.

3. Visit to Rehab Village:

- **Focus:** A successful example of community-led ecosystem restoration.
- **Activities:**
 - **Tour of Restoration Sites:** Participants visited areas where the local community has implemented nature-based solutions, including green water harvesting and tree planting.
 - **Practical Application:** Each participant planted a tree using the Cocoon planting technology, an innovative approach to ensure tree survival in arid conditions.
 - **Observation of Indigenous Forest:** The group also explored a nearby degraded indigenous forest, discussing potential restoration methods that could be replicated.

- **Learning Outcomes:**

- Practical experience in tree planting and an understanding of innovative technologies like the Cocoon system.
- Appreciation for community involvement in ecosystem management and the potential for restoring indigenous forests using local knowledge and modern technology.

Joint Lunch in the field and Reflections:

- **Details:** Participants had a joint lunch in the field, which provided an informal setting for reflecting on the day's visits and discussing insights and ideas inspired by the field experiences. This session helped solidify the day's learning and fostered further discussion on potential ecosystem restoration solutions tailored to the specific needs and challenges of the areas visited.

Impact of Day 3:

Day 3 of the workshop provided participants with invaluable field experience, exposing them to real-world challenges and successes in ecosystem restoration. The visits highlighted the importance of community engagement, the impact of industrial activities on the environment, and the effectiveness of innovative restoration techniques. These insights are crucial for developing practical and sustainable ecosystem management strategies.

Day 4 Group Work and Concluding Presentations:

Venue: National Agricultural Research Center (NARC)

Morning Session: Reflections and Group Work on Problem Tree Analyses

Activities:

Reflections on Field Visits:

- **All Participants Involved**
- **Overview:** Participants shared insights and reflections from the previous day's field visits, discussing the practical challenges and solutions observed in North Zarqa, Balama Village, and Rehab Village.

Group Work: Problem Tree Analyses

- **Facilitators:**
 - Dr. Tareq Khamayseh led the group focusing on the Balama Mining Sites.
 - Dr. Jaafar Wedian guided the group examining the Rihab area.
 - Dr. Raha Alassaf coordinated the youth-focused group discussing innovative watershed thinking.

Objective:

The objective of the problem tree analysis session was to apply a structured approach to identify the root causes, the main problem (trunk), and the consequences (branches) of ecosystem degradation observed in specific areas during the field visits. This methodology helps in visualizing the problems and formulating targeted interventions.

Process:

Participants were divided into three groups, each tasked with focusing on different sites and themes based on the field observations from Day 3:

1. Group 1: Balama Mining Sites

- **Leader:** Dr. Tareq Khamayseh
- **Focus Area:** Addressing soil erosion and environmental degradation due to mining activities.
- **Root Causes Identified:**
 - Unregulated mining operations leading to large-scale displacement of soil.
 - Lack of vegetation cover which normally stabilizes the soil.
 - Poor water management practices exacerbating soil erosion.
- **Main Problem (Trunk):**
 - Significant degradation of the local ecosystem, leading to destabilized soil and reduced ecological functionality.
- **Consequences (Branches):**
 - Loss of biodiversity, decreased soil fertility, and increased vulnerability to further environmental impacts.
 - Negative effects on local water quality and availability for community use.
 - Social impacts, including conflicts over land use and economic losses for local communities reliant on natural resources.

2. Group 2: Rihab Area

- **Leader:** Dr. Jaafar Wedian
- **Focus Area:** Restoration of degraded ecosystems with a focus on water management and vegetation enhancement.
- **Root Causes Identified:**
 - Overgrazing by local livestock, which strips the land of its natural vegetation.
 - Inadequate local practices in water conservation, leading to inefficient water use and further degradation.
 - Historical deforestation and subsequent soil compaction.
- **Main Problem (Trunk):**
 - Widespread ecological degradation resulting in diminished natural water retention and filtration capacities.
- **Consequences (Branches):**
 - Reduced agricultural productivity and increased desertification.
 - Lowered resilience against climatic extremes, such as droughts and floods.
 - Economic decline for local communities, with younger populations migrating to urban areas.

3. Group 3: Innovative and Youth-Led Solutions

- **Leader:** Dr. Raha Alassaf
- **Focus Area:** Leveraging innovation and youth engagement to enhance watershed thinking and ecosystem restoration.
- **Root Causes Identified:**
 - A general lack of engagement and awareness among younger populations about environmental issues.
 - Insufficient incorporation of modern and innovative techniques in traditional restoration practices.
- **Main Problem (Trunk):**
 - Underutilization of innovative approaches and technologies in managing watershed and ecosystem challenges.
- **Consequences (Branches):**
 - Slower adoption of sustainable practices that could potentially revolutionize ecosystem management.
 - Missed opportunities for local and global partnerships in restoration projects.

Methodology:

Each group utilized visual aids to create their problem trees, engaging in brainstorming sessions facilitated by their leaders. Participants employed markers and large sheets of paper to draw out the problem tree, which helped in visualizing the connections between root causes, the central problem, and its various consequences.

Output:

The session concluded with each group developing a conceptual model for ecosystem restoration interventions. These models included proposed solutions like:

- **For Balama:** Creation of siltation ponds, installation of gabions and check dams, and community-based monitoring and maintenance programs.

- **For Rihab:** Implementation of horizontal stone walls for water harvesting, leaky dams, and gully plugs along with community training on sustainable land management practices.
- **For Innovative Solutions:** Development of youth-led projects using geo-web technology, erosion control blankets, and promoting community workshops to raise awareness and engagement in ecosystem management.

Impact

The problem tree analyses effectively equipped participants with a clear understanding of the interconnected nature of ecosystem issues and provided a structured way to approach restoration efforts. These analyses are foundational for developing detailed, actionable plans that address both the symptoms and root causes of environmental degradation.

Afternoon Session: Concluding Presentations and Meeting with Policymakers

Activities:

Concluding Group Work:

- **Group Leaders Presented Their Findings**
- **Discussion:** Detailed discussion on the proposed interventions for each site, addressing both the technical feasibility and the potential social impact.

Presentations of Recommendations:

- **Presenters:** Group leaders presented their restoration strategies and the underlying problem tree analyses to policymakers and key stakeholders.
- **Key Recommendations Included:**
 - **Balama Mining Sites:** Implement siltation ponds, gabions, and check dams; engage with mining operators for environmental stewardship; promote community-based monitoring.
 - **Rihab Area:** Establish horizontal stone walls for water harvesting, implement leaky dams and gully plugs; enhance community participation in using indigenous knowledge for ecosystem management.
 - **Innovative Tools Presentation by Youth:** Advocated for the use of geo-web technology, erosion control blankets, and other low-cost tools for ecological restoration, stressing the importance of community and youth involvement in sustainability initiatives.

Open Discussion with Key Stakeholders:

- **Facilitated by:** Dr. Raha Alassaf – Eng Mirra Haddad
- **Focus:** Stakeholders provided feedback on the presentations, discussing the viability, potential challenges, and the support needed from governmental and international bodies to implement these strategies.

2. Meeting Outcomes:

- **Stakeholder Engagement:** Enhanced understanding and commitment from policymakers to support ecosystem restoration projects based on the presented recommendations.
- **Action Points:** the need for a Comprehensive Basin-Level Study as a detailed study across the Amman Zarqa Basin to identify soil erosion hotspots. This study should

integrate advanced GIS and remote sensing technologies to map erosion severity and dynamics, which will inform targeted, effective restoration strategies and interventions.

Conclusion of Day 4:

Day 4 solidified the practical applications of the workshop's teachings through intensive group work and critical stakeholder engagements. The concluding presentations facilitated a meaningful exchange between the workshop participants and policymakers, setting the stage for actionable restoration projects that incorporate both traditional and innovative approaches to ecosystem management. The day emphasized the importance of continued collaboration among local communities, experts, and government bodies to achieve sustainable restoration outcomes.

New Insights from Stakeholder Engagement in Ecosystem Restoration

The active involvement of a broad spectrum of stakeholders, including local community members, during the Workshop provided invaluable perspectives on the complex interplay between ecosystem degradation and restoration efforts. This section delineates the pivotal insights and learnings that emerged from extensive discussions and collaborative interactions among participants from diverse sectors.

Engaging Local Communities

The involvement of local communities, who are often directly impacted by environmental degradation, was instrumental in the workshop. Their firsthand experiences and indigenous knowledge significantly deepened the understanding of specific local challenges and viable solutions within the Amman Zarqa Basin:

1. **Utilization of Traditional Knowledge:** Community elders contributed traditional land management and water conservation practices that have been preserved over generations. These practices, including the time-tested Himma system, demonstrated their effectiveness in sustainable resource management.
2. **Community-Centric Problem Identification:** The local communities' intimate knowledge of their environment enabled them to pinpoint specific ecological changes impacting their lives. Their insights into how increased siltation has compromised agricultural productivity and water quality were particularly enlightening.
3. **Localized Climate Change Impacts:** Testimonies from community members underscored the localized effects of climate change, such as altered precipitation patterns and intensified drought periods, which have aggravated soil erosion and siltation.

Insights from Youth Engagement

Youth participants brought innovative perspectives and approaches to traditional ecosystem restoration methods:

1. **Integration of Modern Technologies:** The younger cohort showcased how contemporary technologies, such as GIS and remote sensing, could be seamlessly integrated with conventional practices to enhance the efficiency of ecosystem monitoring and restoration projects.
2. **Introduction of Innovative Restoration Tools:** Youth presentations highlighted several cost-effective and efficient tools, such as seed bombs and Cocoon tree planting technologies. These innovations are poised to significantly bolster reforestation efforts without necessitating large-scale financial investments.
3. **Enhancement of Advocacy and Awareness:** The youth demonstrated a robust commitment to environmental advocacy, emphasizing the need for heightened community education and engagement as crucial drivers of restoration initiatives.

Community Operation and Management of Soil Conservation Interventions

Effective operation and management (O&M) of soil conservation interventions was highlighted by participants to be crucial for the sustainability of restoration efforts. The involvement of community members in these processes not only enhances intervention effectiveness but also fosters ownership and stewardship. Key strategies include:

1. **Training and Capacity Building:** Community members receive training to effectively manage and maintain conservation practices, enhancing local capacity and reducing reliance on external support.

2. **Participatory Monitoring and Evaluation:** Community-led teams should be equipped to monitor the performance of conservation measures, ensuring timely maintenance and adaptive management.
3. **Local Conservation Committees:** These committees, comprising local leaders and knowledgeable individuals, should be empowered to make decisions regarding the maintenance and scaling of conservation measures.
4. **Economic Integration:** Conservation efforts should be linked with local economic activities, providing direct benefits and incentivizing diligent O&M practices.
5. **Leveraging Traditional Knowledge:** Indigenous knowledge should be integrated into the conservation measures, ensuring they are culturally appropriate and more likely to be maintained effectively by the community.

Collaboration Between Stakeholders

The workshop fostered the formation of new collaborations between various stakeholders, including policymakers, researchers, and practitioners:

1. **Holistic Problem-Solving Approach:** The discussions emphasized the need for an integrated approach that melds policy intervention, scientific research, and community practices to holistically address ecosystem degradation.
2. **Influence on Policy Making:** Ground-level insights informed policymakers, enabling them to devise more effective, practical, and impactful regulations and guidelines that reflect the realities faced by local communities.
3. **Networking for Sustained Collaboration:** The workshop acted as a catalyst for establishing networks that stakeholders can leverage to propel ecosystem restoration projects forward. These networks are essential for the exchange of resources, knowledge, and best practices across various regions and disciplines.

The inclusive engagement of diverse stakeholders, particularly local communities and youth, brought forth critical insights essential for the effective restoration of ecosystems in the Amman Zarqa Basin and similar regions. These insights not only enrich the scientific and practical understanding of the issues but also ensure that the solutions developed are comprehensive, sustainable, and culturally sensitive. The workshop has laid a foundation for future initiatives, highlighting the significance of inclusive stakeholder engagement in tackling environmental challenges.

Collective Learning and Expertise Exchange at the Ecosystem Restoration Workshop

The Workshop successfully convened a diverse group of experts, practitioners, and emerging professionals, each contributing significant knowledge and expertise aimed at addressing soil erosion and dam siltation issues within the Amman Zarqa Basin. The synergy created by this convergence facilitated an impressive exchange of ideas, establishing a multidisciplinary dialogue essential for the comprehensive tackling of environmental challenges.

Composition and Diversity of Expertise

The assembly of participants was strategically diverse, including hydrologists, engineers, policy makers, NGO representatives, academicians, and community members. This diversity ensured a multi-faceted discussion, enriching the workshop with a range of perspectives from theoretical frameworks to practical applications. The engagement of young professionals and students introduced innovative approaches and technologies, highlighting the workshop's commitment to integrating cutting-edge science with traditional methods.

Principal Areas of Knowledge Exchange

- **Technical Expertise in Ecosystem Management:** The workshop benefitted from the participation of seasoned engineers and hydrologists who shared advanced techniques for mitigating dam siltation and managing watersheds effectively. Practical case studies, like the Al Majedyeh site, demonstrated successful applications of nature-based solutions, providing actionable insights for participants.
- **Policy and Economic Frameworks:** Discussions led by experts such as Eng. Amjad Abdulqader from IUCN and Ms. Dina Abu Areedah elaborated on the policy and economic implications of ecosystem restoration. These sessions provided a nuanced understanding of the regulatory and financial ecosystems, equipping participants with knowledge to navigate and leverage these frameworks for optimal project outcomes.
- **Adoption of Innovative Technologies:** The integration of modern technological tools like GIS, remote sensing, and Google Earth Professional was a highlight, with youth participants actively demonstrating their applications. These tools are pivotal for precise monitoring and management of ecological changes, fostering a technical skillset among attendees that is essential for contemporary environmental management.
- **Community Involvement and Indigenous Practices:** The presentation on the "Himma" system by Eng. Nawras Al Jazzi underscored the importance of blending traditional knowledge with modern environmental practices. This session illustrated how community-based approaches could be seamlessly integrated with scientific methods to create sustainable and culturally respectful environmental solutions.

Impact and Outcomes of Collective Learning

The structured interactive sessions, particularly the problem tree analyses, were instrumental in enabling participants to collaboratively dissect complex environmental issues. This collective approach not only deepened understanding but also fostered a collaborative ethos among participants, essential for the sustained success of ecosystem restoration initiatives.

Feedback from participants underscored a high valuation of the knowledge exchange, noting particularly the practical application of discussed concepts and the enhancement of professional networks. Many participants expressed commitments to apply the insights gained and to pursue further collaborative opportunities, reflecting the workshop's success in fostering a proactive and knowledgeable community of practice.

The collective learning experience at the Ecosystem Restoration Workshop exemplifies the significant benefits of interdisciplinary collaboration in tackling environmental challenges. By merging diverse

expertise and fostering a dynamic exchange of ideas, the workshop has not only equipped participants with enhanced capabilities but also reinforced a network of professionals poised to advance ecosystem restoration efforts both locally and globally. The ongoing application of knowledge and collaborations initiated during this event are anticipated to have lasting impacts on environmental conservation efforts.

Reflections on Field Visits and Feedback from Local Community and Stakeholders

The field visits during the Workshop provided participants with practical exposure to the environmental challenges and ongoing restoration efforts within the Amman Zarqa Basin. These interactions with local communities and stakeholders were crucial for collecting insights and feedback to guide future restoration strategies.

Reflections on Field Visits

Participants visited three distinct sites—North Zarqa, Balama Village, and Rehab Village—each highlighting unique environmental challenges and opportunities for ecosystem restoration.

- **North Zarqa:** This site displayed significant soil erosion issues and water management challenges. Discussions with the local community unveiled a conflict regarding water harvesting; some residents viewed it as beneficial for agriculture and erosion prevention, while others raised safety concerns for children traveling to school. This underscored the need for robust community engagement strategies to reconcile these differences and promote inclusive management of water harvesting initiatives.
- **Balama Village:** The detrimental impact of mining on soil erosion and ecosystem degradation was apparent. The visit initiated dialogues on integrating mining operations into the ecosystem restoration efforts, suggesting the use of mining by-products as restoration materials and to engage this industry owners in the dialogue.
- **Rehab Village:** This location served as an exemplar of effective community-driven ecosystem restoration. The participants observed various nature-based solutions implemented by the community, including innovative tree planting techniques such as the Cocoon system.

Feedback from Local Community and Stakeholders

Feedback from the stakeholders and community members was pivotal in understanding the social dynamics and logistical challenges of ecosystem restoration projects:

- **Understanding of Watershed Dynamics:** A notable gap identified was a general lack of understanding among community members regarding the broader watershed dynamics affecting their local environments. This gap underscores the need for initiatives aimed at enhancing watershed literacy to ensure that community members can contribute effectively to watershed management strategies.
- **Absence of Soil Erosion Maps:** Another critical feedback point was the absence of detailed soil erosion maps, which are essential for planning and implementing targeted restoration strategies. The development and dissemination of such maps would enable more precise interventions and foster a deeper understanding of erosion patterns within the community.
- **Community Engagement:** There was a strong community interest in being more actively involved in the planning and implementation of restoration projects. Community members stressed the importance of integrating their traditional knowledge and practices into the restoration strategies.
- **Education and Awareness:** The need for enhanced educational initiatives emerged as a recurrent theme. There was a consensus on the importance of educating the community about the ecological and economic benefits of ecosystem restoration and how individual actions contribute to broader environmental impacts.
- **Collaboration with Industry:** Representatives from the mining industry expressed an interest in participating in ecosystem restoration. They proposed collaborative approaches where mining by-products could be repurposed for restoration activities, demonstrating a willingness to support sustainable practices.

- **Youth Involvement:** The active participation and innovative contributions of youth were highlighted by community leaders and stakeholders. There was a strong advocacy for greater inclusion of young individuals in future projects, recognizing their role in bringing new perspectives and adopting advanced technologies.

The way Forward for Ecosystem Restoration in the Amman Zarqa Basin

As the Ecosystem Restoration Workshop concluded, participants and organizers outlined a comprehensive path forward to address the pressing issues of soil erosion and dam siltation in the Amman Zarqa Basin. The following strategic steps are recommended to ensure the sustainability and effectiveness of restoration efforts:

1. Comprehensive Watershed Management Study:

- **Erosion Hotspot Identification:** Conduct a detailed study to map soil erosion hotspots using advanced GIS and remote sensing technologies. This study will help prioritize areas for intervention and tailor restoration strategies to specific site conditions.
- **Integrated Watershed Management Plan:** Develop a holistic watershed management plan that addresses both upstream and downstream needs to improve water quality, reduce siltation, and enhance biodiversity.

2. Policy Development and Advocacy:

- **Policy Framework Enhancement:** Utilize the data, findings, and recommendations from the workshop to influence and develop robust policy frameworks that support ecosystem restoration.
- **Stakeholder Collaboration:** Engage with policymakers, community leaders, and environmental NGOs to foster policies that are inclusive and representative of all stakeholder interests.

3. Capacity Building and Stakeholder Engagement:

- **Educational Programs:** Develop and deliver targeted training programs designed to enhance local capacity for implementing and sustaining ecosystem restoration projects.
- **Community Involvement:** Ensure that local communities are actively involved in the planning, execution, and monitoring of restoration activities to enhance the social acceptability and sustainability of interventions.

4. Monitoring, Evaluation, and Adaptation:

- **Continuous Monitoring:** Implement a comprehensive monitoring framework to assess the effectiveness of restoration interventions over time. This should include both ecological and socio-economic indicators.
- **Feedback Mechanism:** Establish a robust feedback mechanism to adapt and refine strategies based on monitoring results and stakeholder input, ensuring that restoration efforts remain relevant and effective under changing conditions.

5. Innovative Financing Mechanisms:

- **Funding Strategies:** Explore innovative financing options such as payment for ecosystem services, green bonds, and environmental impact bonds to ensure the long-term sustainability of restoration projects.
- **Private Sector Engagement:** Encourage private sector involvement through corporate social responsibility (CSR) initiatives and public-private partnerships that leverage private funding for public good.

6. **Industry Partnerships:** Establishing partnerships with local industries can provide practical and financial support for restoration efforts, transforming potential challenges into collaborative opportunities.

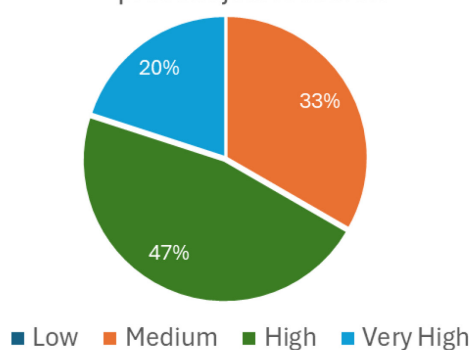
The path forward for ecosystem restoration in the Amman Zarqa Basin is clear and actionable. By implementing these strategic steps, stakeholders can effectively combat soil erosion and dam siltation, thereby securing ecological and socio-economic benefits for the region. Collaborative efforts, adaptive management, and sustained engagement are key to achieving the long-term success of ecosystem restoration initiatives. This proactive and integrated approach will not only restore degraded landscapes but also build resilience against future environmental challenges.

Evaluation by the participants:

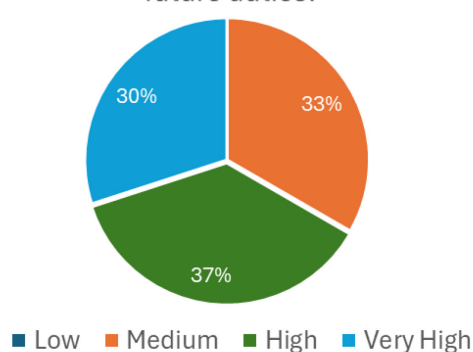
Below are the statistics and diagrams of the participants feedback on the workshop overall activities:

Criteria	Low	Medium	High	Very High
a. Value of this workshop to my present job/research	0%	33%	47%	20%
b. Value of this workshop to future duties.	0%	33%	37%	30%
c. Subject matter coverage.	0%	20%	63%	17%
d. Preparation of lectures & presentations	0%	17%	73%	27%
e. Delivery of presentations.	0%	20%	57%	23%
f. Ability of staff to motivate & hold interest	0%	13%	50%	37%
g. Handouts and/or workbooks	3%	13%	60%	23%
h. Audio/Visual aids.	0%	10%	73%	17%
i. Exercises and/or Demonstrations	3%	3%	50%	43%
j. Value of tools provided	0%	0%	53%	47%
k. Field work trip	0%	3%	33%	63%
l. Practical examples and case studies	0%	10%	33%	57%
m. Food. Logistics and services	0%	17%	47%	37%
Workshop duration	Too Short	Just Right	Too long	
	23%	57%	20%	
Workshop Expectations were	Exceeded	Met	Not met	
	43%	57%	0%	
Your overall reaction to this workshop was	Outstanding	Good	Not Good	
	47%	53%	0%	

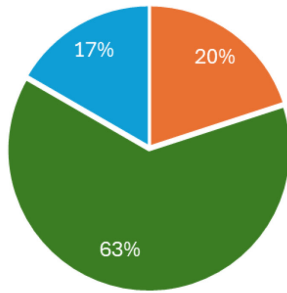
a. Value of this workshop to my present job/research



b. Value of this workshop to future duties.

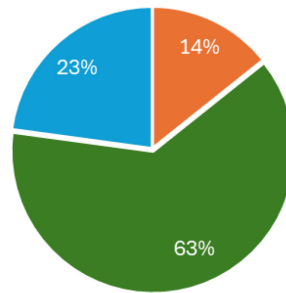


c. Subject matter coverage.



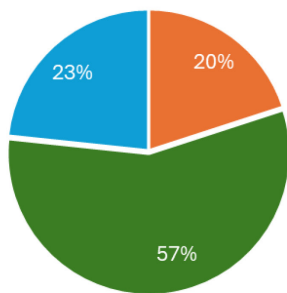
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d. Preparation of lectures & presentations



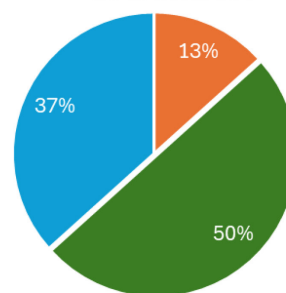
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e. Delivery of presentations.



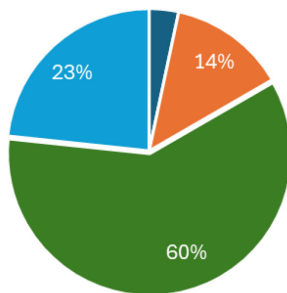
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f. Ability of staff to motivate & hold interest



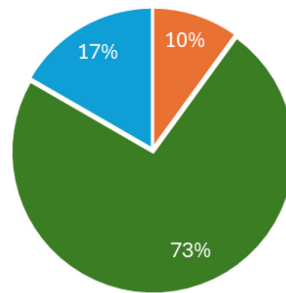
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g. Handouts and/or workbooks



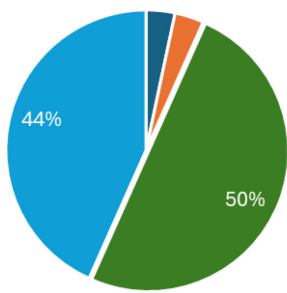
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h. Audio/Visual aids.



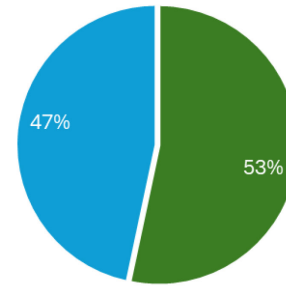
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i. Exercises and/or Demonstrations



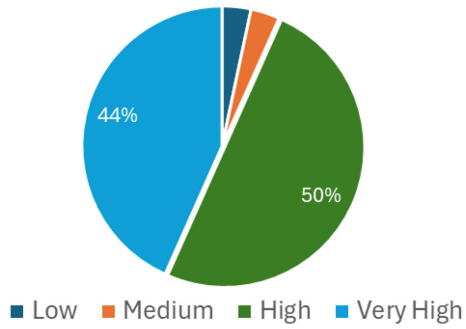
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j. Value of tools provided

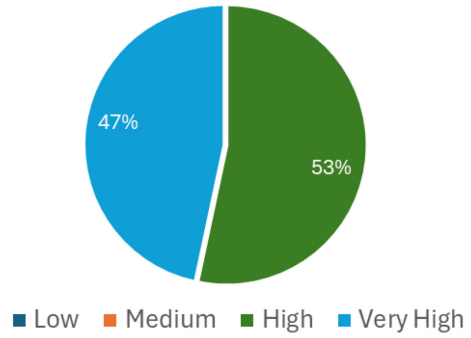


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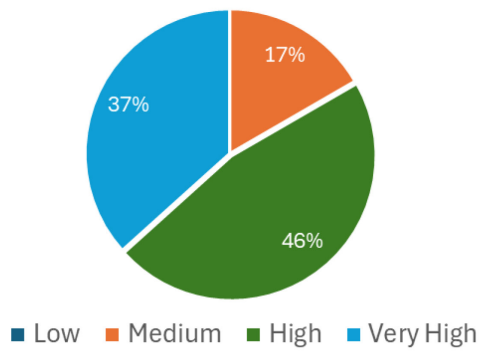
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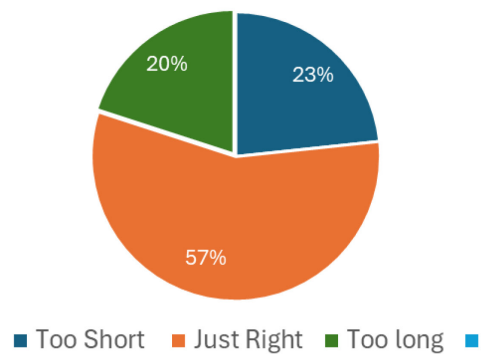
j. Value of tools provided



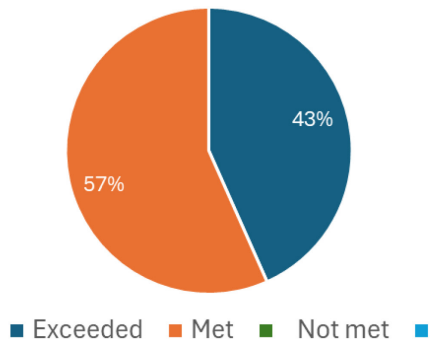
m. Food, Logistics and services



Workshop duration



Workshop Expectations were



Your overall reaction to this workshop was

