Assessing the effectiveness of agro-silvo-pastoral rehabilitation for enhanced water productivity and resilience in the Jordan Valley

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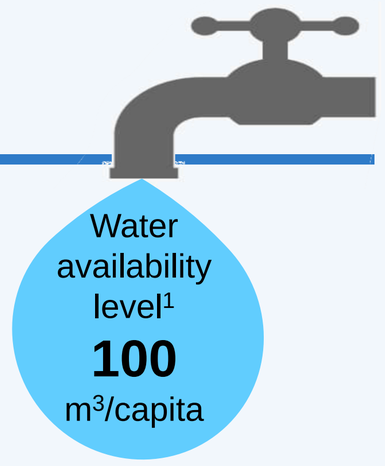
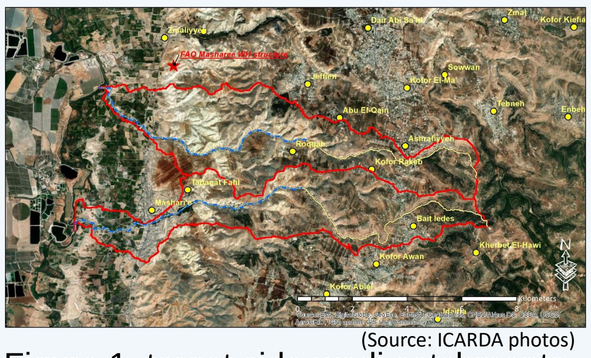
Background

- **Water scarcity in Jordan:** Jordan is among the top five most water-scarce countries globally, facing limited rainfall and water influxes, severely impacting agricultural production
- **Climate change challenges:** Predictions indicate rising temperatures, declining seasonal rainfall, and more intense rainstorms, leading to floods, erosion, and droughts, exacerbating Jordan's water crisis
- **Agricultural adaptation solutions:** innovative technologies like water harvesting and agroecological zoning are being explored to address water scarcity and promote sustainable climate smart practices



Objectives

1. Assessing agro-silvo-pastoral rehabilitation and sustainable watershed management effectiveness
2. Enhancing water productivity and resilience in dry conditions and climate change.
3. Understanding local community perceptions of ecosystem services
4. Informing decision-making for impactful ecosystem restoration



(Source: ICARDA photos)

Figure 1. target side-wadi catchments (red boundaries) and villages

Methodological Approach

1. Target Area Identification and Local Needs Assessment
2. Co-Designed Management Plan
3. Mixed-Methods Approach
4. Biophysical and Socio-Economic Evaluation
5. Community Engagement and Feedback
6. Small-Scale Test Site Implementation
7. Water and Sediment Dynamics Assessment
8. Perception Survey and Data Collection

Table 1. Preliminary selection criteria and datasets used for pre-selection and rapid watershed diagnostics

Variable	Metric	Source	Resolution
Land cover	Land cover classes	COPERNICUS[2]	100 m
Rainfall	Average annual rainfall	CHIRPS[3]	5 km
Slope	Slope	NASA[4]	30 m
Soil texture	Sand content	ISRIC[5]	250 m
	Rock content		
	Clay content		
Water occurrence	Surface water occurrence	JRC[6]	30m

- Curve Number (CN) assessment method for runoff estimation
- Socio-economic evaluations focusing on demographics, poverty levels, and community dynamics

Figure 2. Focus Group Discussions meeting with local communities

(Source: ICARDA photos)

Figure 3. Small-Scale Test Site (using native shrub seedlings and micro-water harvesting techniques)

(Source: ICARDA photos)

- Rangeland Hydrology and Erosion Model (RHEM) for water and sediment dynamics analysis
- Perception surveys with participating and non-participating farmers in the local community
- A ranking tool to assess the perceived value of **ecosystem services related to erosion control, cultural heritage, biodiversity, and forage production**
- Analyzed data using descriptive statistics and ANOVA

Key Findings

Study Area Description:
1. Situated in the Northern Side Wadis Basin, 21 km²
2. Average annual rainfall ranging from 350 mm to 500 mm

CN Assessment Results:
1. Average annual runoff : 84.6 mm / runoff ratio of 18.9%
2. Different land cover types exhibited varying runoff coefficients and erodibility classes
3. 76% of the sub-watershed is restorable, with 15% low risk, 56% medium risk, and 28% high risk of erosion

Restoration Efforts and Plant Species Selection:
1. Native shrubs like Atriplex halimus are selected for restoration
2. Seedlings showed an 86.4% survival rate at the pilot site

Runoff and Erosion Modeling:
1. RHEM simulations indicated small runoff amounts in areas with low erodibility (class 1) and higher runoff in erodibility classes 2 and 3
2. Restored scenarios showed lower runoff and soil loss rates, substantial vegetation cover, increased biodiversity, and potential carbon sequestration

Community Perception of Ecosystem Services:
1. Community agreement (90-95%) on the importance of restoration and regulating services, cultural services, biodiversity services, and livelihood services
2. Participation in restoration projects positively influenced farmers' perception of ecosystem services, especially in restoration and regulating services

Influence of Sociodemographic Factors:
1. Gender and age significantly affected the perception of restoration and regulating services
2. Educational level significantly influenced perceptions of biodiversity services and livelihood services.

Concluding remarks and practical implications

- Targeted restoration in the sub-watershed could reduce erosion, benefiting agriculture while minimally affecting surface runoff
- Local communities actively participated, indicating high acceptance of rehabilitation-driven ecosystem services
- Considering the perceptions of local communities regarding rehabilitation objectives can boost public support for these projects
- It is likely that focusing on these areas in future youth projects (from 18 to 30 years old) will have a positive impact on ecosystem services.
- Further research in these areas is likely to positively impact ecosystem services. To achieve this, it is crucial to enhance community awareness about ecosystem services through lectures, training, and practical activities.

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