

Evidences

Study #4081

Contributing Projects:

- P2067 - Lessons learnt from on-farm to watershed level interventions: out-scaling of community based watershed management strategies to diverse socio-ecological environment

Part I: Public communications

Type: OICR: Outcome Impact Case Report

Status: On-going

Year: 2020

Title: Rehabilitation of dry agro-pastures through community-based mechanized micro water harvesting and flood-irrigation agriculture to benefit to 1,000 ha/ year in Jordan

Short outcome/impact statement:

Mechanized micro-water harvesting packages developed by ICARDA and the Jordanian National Agricultural Research Center (NARC) are being scaled out in collaboration with local communities, targeting at least 1,000 hectares per year and 20,000 km² in the long term. The community-based approach effectively rehabilitates degraded dry agro-pastoral watersheds through water harvesting, plantation of native vegetation, and enhanced downstream flood-water agriculture. Community empowerment ensures long-term sustainability of the interventions. The program is expected to equip communities better for drought conditions while improving carbon storage in the uplands and reducing the need for agricultural inputs in the lowlands.

Outcome story for communications use:

Jordan rehabilitates its vast degraded Badia region at the micro scale

Jordan's arid and degraded Badia region covers nearly 90% of the country's area and hosts over 60% of its livestock. In collaboration with the National Agricultural Research Center (NARC), the CGIAR Research Program on Water, Land and Ecosystems (WLE) and International Center for Agricultural Research in the Dry Areas (ICARDA) have developed a new way to identify potentially suitable areas for rehabilitation of watersheds, and the Jordanian government is rolling out community-based, mechanized, micro water harvesting packages over at least 1,000 hectares of agro-pastures a year.

Traditionally, assessment of suitability for watershed rehabilitation has relied on mapping Geographic Information System (GIS) layers, for example for climate, topography, soil and land use. However, this static methodology does not account for more dynamic criteria such as the surface water that is available for harvesting at any given time. WLE/ICARDA therefore developed a new methodology that combines GIS data with a simulation of surface run-off in order to determine which areas are most suited for rehabilitation activities. Existing technology on a micro water harvesting approach using the Vallerani tractor plow system was also adapted to the conditions in the Badia by WLE/ICARDA and national partners in Jordan and Syria.

Rehabilitation of these areas is expected to benefit low-income rural communities by increasing the native fodder available for their livestock in the marginal drylands, and through the production of forage in the flood-irrigated agricultural system known as 'marab'. Sustainable grazing is promoted in the uplands, while in the lowlands, marab cereal crop cultivation (mostly of barley) is being enhanced – increasing biomass production between 10 and 50 times compared with traditional methods. This integrated watershed approach seeks to strengthen the value chain for the benefit of communities, taking care to consider the needs of vulnerable groups such as women, for instance through women-led dairy processing units. The engagement of communities such as the former tribal Bedouin nomads in Jordan through awareness-raising activities is also critical to the success of the research initiatives.

In 2021, ICARDA and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) developed a small floodwater harvesting technique to test this same approach in Ethiopia, supported by WLE. Overall, dryland rehabilitation is expected to equip communities better for drought conditions, while improving carbon storage in the uplands and reducing the need for agricultural inputs in the lowlands.

Links to any communications materials relating to this outcome: <Not Defined>

Part II: CGIAR system level reporting

Link to Common Results Reporting Indicator of Policies : No

Stage of maturity of change reported: Stage 1

Links to the Strategic Results Framework:

Sub-IDs:

- Reduced smallholders production risk
- Increased resilience of agro-ecosystems and communities, especially those including smallholders

Is this OICR linked to some SRF 2022/2030 target?: Too early to say

Description of activity / study: <Not Defined>

Geographic scope:

- National

Country(ies):

- Jordan

Comments: The mechanized community-driven micro water harvesting approach was tested in Syria.

Key Contributors:

Contributing CRPs/Platforms:

- WLE - Water, Land and Ecosystems

Contributing Flagships:

- F2: Land and Water Solutions for Sustainable Intensification (LWS)
- F1: Restoring Degraded Landscapes (RDL)

Contributing Regional programs: <Not Defined>

Contributing external partners:

- BAU Jordan - Al-Balqa` Applied University
- USFS - United States Forest Service
- AFESD - Arab Fund for Economic and Social Development
- NARC - National Agriculture Research Center
- WADI - Watershed and Development Initiative
- Utrecht University
- IHE Delft - IHE Delft Institute for Water Education

CGIAR innovation(s) or findings that have resulted in this outcome or impact:

WLE/ICARDA developed a new out-scaling assessment methodology to identify potentially suitable areas for watershed rehabilitation. The approach involves merging traditional site suitability assessment based on GIS layers (e.g., climate, topography, soil, land use) with dynamic surface runoff modeling. The innovation is to use globally harmonized modeling in collaboration with Utrecht University (PCR-GLOBWB model). Thus, simulation of surface runoff occurrence (probability) is used as an input for site suitability assessment. The background is that water harvesting certainly requires surface runoff (to harvest); better understanding of surface runoff occurrence, in space and time allows better (suitability) planning and moving from purely 'static' maps (e.g., rainfall isohyets) which not necessarily allow conclusions on available surface water. Recently (2021), ICRISAT and ICARDA have developed a small additional floodwater harvesting activity to test this approach in Ethiopia, supported by WLE.

Innovations: <Not Defined>

Elaboration of Outcome/Impact Statement:

WLE/ICARDA is supporting the Jordanian Government to implement a new micro water harvesting approach for rehabilitation and productivity enhancement in Jordan's degraded marginal drylands, known as the Badia (1). This arid region covers nearly 90% of the country's area and hosts more than 60% of its livestock (2). The government has set an ambitious annual target of 1,600 hectares to be rehabilitated. The long-term target is 20,000 km². The Prime Minister, speaking in January 2021, mentioned plans to further enhance water harvesting-based solutions for the Badia's rehabilitation (3), building on work by WLE/ICARDA and the National Agricultural Research Center (NARC). This includes marabs (4), mesoscale water harvesting systems that support high agricultural yields (5).

The mechanized micro water harvesting approach, using the Vallerani tractor plow system, is an existing technology that was adapted to Badia conditions in Syria and Jordan by WLE/ICARDA and the national agricultural research services. WLE/ICARDA and NARC developed an advanced Badia research site in Jordan (2) in 2016 to investigate soil-water-plant dynamics as well as local community management interactions (2). WLE/ICARDA also developed scalability assessment strategies combining static and dynamic criteria, an innovative way to strengthen site suitability assessment (6). This involved merging traditional site suitability assessment based on GIS with dynamic surface runoff modeling, and uses a global harmonized modeling tool, PCR-GLOBWB (PCRaster Global Water Balance) in collaboration with Utrecht University. Simulation of surface runoff probability is used as an input for site suitability assessment. The approach is also being tested for floodwater harvesting in Ethiopia and across the Middle East in a new FAO study.

The beneficiaries are low-income rural communities in Jordan's Badia, who will benefit through increased native fodder and forage production in flood-irrigated marab agriculture in lowland areas (5). Sustainable watershed management is promoted through targeted livestock grazing/resting plans in the uplands (micro water harvesting areas) and enhanced cereal crop production (mostly barley) in lowland flood-irrigated zones. This can enhance biomass production by 10–50 times compared with traditional barley agriculture (4). The integrated watershed approach stimulates sharing of benefits and holistic management by the community. Bilateral projects complement socio-economic activities through enhanced livestock value chain activities and gender considerations (e.g. women-led dairy processing units) (7).

References cited:

Evidence: journal articles, reports, emails, media coverage etc.:

1. Jordan Ministry of Environment. 2015. The Aligned National Action Plan to Combat Desertification in Jordan 2015–2020. Amman, Jordan: Government of Jordan.
<https://knowledge.unccd.int/sites/default/files/naps/Jordan%2520-%2520eng%25202015-2020.pdf>
 2. Strohmeier, S.; Fukai, S.; Haddad, M.; Al Nsour, M.; Mudabber, M.; Akimoto, K.; Yamamoto, S.; Evett, S.; Oweis, T. 2021. Rehabilitation of degraded rangelands in Jordan: The effects of mechanized micro water harvesting on hill-slope scale soil water and vegetation dynamics. *Journal of Arid Environments* 185: 104338. <https://doi.org/10.1016/j.jaridenv.2020.104338>
 3. Speech by Prime Minister Bisher Al-Khasawneh in January 2021:
https://cgiar-my.sharepoint.com/:v/g/personal/s_strohmeier_cgiar_org/ETJz0j8-oR9EoZ4WPTfp1roBS-o-U6GnaMeBbkmMI6THHQA?e=uEtVs9
 4. Verbist, J. 2020. Marab – Water harvesting based floodplain agriculture [Jordan]. WOCAT SLM Database. https://qcat.wocat.net/en/wocat/technologies/view/technologies_5770/
 5. Dhehibi, B.; Haddad, M.; Strohmeier, S.; El-Hiary, M. 2020. Enhancing a traditional water harvesting technique in Jordan's agro-pastoral farming system. Lebanon: International Center for Agricultural Research in the Dry Areas. <https://hdl.handle.net/20.500.11766/11506>
 6. Sarcinella, M.; Strohmeier, S.; Haddad, M.; Yamamoto, S.; Evett, S.; Sterk, G. 2020. Suitability of arid land rehabilitation technologies: Simulation of water harvesting based solutions in Middle Eastern agro-pastures. 3rd Conference of the Arabian Journal of Geoscience, Sousse, Tunisia, November 2–5. https://www.researchgate.net/publication/345253442_Suitability_of_arid_land_rehabilitation_technologies_simulation_of_water_harvesting_based_solutions_in_Middle_Eastern_agro-pastures
 7. Blog on community-based dairy production units:
<https://www.icarda.org/media/news/key-community-engagement-jordanian-badia>
 8. Strohmeier, S. 2019. Chapter 3: Desertification; Sub-chapter 3.7.5: Integrated watershed management; 3.7.5.1: Jordan. In: IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. Geneva, Switzerland: Intergovernmental Panel on Climate Change. Pp 78-80.
https://www.ipcc.ch/site/assets/uploads/2019/08/2d.-Chapter-3_FINAL.pdf
- Promotional products: blogs, outreach materials (cannot be used as evidence but useful for promotion):
- Reversing desertification to enhance food security. ICARDA.
<https://www.icarda.org/media/drywire/reversing-desertification-enhance-food-security>
 - Water harvesting. ICARDA. <https://www.icarda.org/research/innovations/water-harvesting>
 - Water harvesting for restoring rangelands in Jordan. ICARDA.
<https://www.icarda.org/media/drywire/water-harvesting-restoring-rangelands-jordan>
 - Supporting dairy farmers for better incomes and product quality. ICARDA.
<https://www.icarda.org/media/news/supporting-dairy-farmers-better-incomes-and-product-quality>
 - Badia Restoration Project webpage.
<http://jo.chm-cbd.net/implementation/projects/brp-undp-restoration-sustainable-livelihoods-creation-and-natural-resource>

Quantification: <Not Defined>

Gender, Youth, Capacity Development and Climate Change:

Gender relevance: 0 - Not Targeted

Youth relevance: 0 - Not Targeted

CapDev relevance: 0 - Not Targeted

Climate Change relevance: 2 - Principal

Describe main achievements with specific **Climate Change** relevance: Adaptation: water harvesting – bridging droughts and dry spells and securing productivity also in dry years.

Mitigation: carbon storage (uplands) and less agricultural inputs (local downstream high-yield agriculture) [1, 6].

Other cross-cutting dimensions: Yes

Other cross-cutting dimensions description: The initiative in Jordan works with local communities, former tribal Bedouin nomads and now quasi-sedentary, for i) project implementation and ii) monitoring of soil, water and plant dynamics [6, 7]. Frequent capacity development initiatives raised awareness and encouraged community members to be valuable research supporters. Community-based organizations were developed, such as women-led dairy production group [8].

Field implementation and CapDev activities have been pursued through bilateral projects (mainly United States Forest Service and Arab Fund for Economic and Social Development); WLE/ICARDA particularly contribute through research activities.

Outcome Impact Case Report link: [Study #4081](#)

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