

Evidences

Study #3348

Contributing Projects:

- P478 - Analyzing impact of various Agricultural Water Management Interventions on watershed hydrology and various ecosystem trade-offs in Bundelkhand region of Central India

Part I: Public communications

Type: OICR: Outcome Impact Case Report

Status: Completed

Year: 2019

Title: Building community prosperity through scaling out WLE/ICRISAT agricultural water management interventions for sustainable crop intensification in Central India

Short outcome/impact statement:

Water harvesting and productivity interventions implemented by WLE/ICRISAT and the Central Agroforestry Research Institute on a pilot watershed in central India had significant impacts on water resources, incomes and farmers' livelihoods. As a result, the Government of Uttar Pradesh has asked ICRISAT and a consortium of national partners to scale the model out to over 35,000 ha.

Outcome story for communications use:

Farmers see rewards of effective land and water management in Uttar Pradesh

Yields are up and fewer farmers in the Indian state of Uttar Pradesh are migrating to cities, following a project that almost tripled their agricultural incomes. The initiative in Jhansi district introduced an array of practical methods, including water-harvesting structures, effective land-management practices and improved cultivars. These interventions made more water available for irrigation, and increased crop and livestock yields, reducing farmers' need to seek work elsewhere. To help other struggling communities, the Government of Uttar Pradesh requested the project be scaled-up to seven districts.

The 1,250 hectares (ha) watershed, inhabited by nearly 3,000 people in three villages, faced water scarcity, land degradation and poverty. Water available to farmers had declined due to over-extraction, poor groundwater recharge, and land-use change (1). This, coupled with high temperatures and frequent droughts, resulted in low agricultural productivity. With women travelling farther to collect water for domestic uses, school attendance was also poor. And villagers migrated out to find other ways to support themselves. (2)

The project was conducted jointly by the CGIAR Research Program on Water, Land and Ecosystems (WLE) International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Indian Council of Agricultural Research's Central Agroforestry Research Institute (CAFRI) Government of UP and farming community. Between 2012 and 2016, they restored a traditional water-harvesting tank (haveli); constructed nine 'check dams' to slow down stream-flow; introduced science-based soil- and water-conservation techniques; demonstrated integrated nutrient and pest management methods; and supported farmers to diversify and intensify crop production through agroforestry.

Renovating the tank and building check dams increased rainwater storage capacity and helped to prevent 200,000m³ of runoff annually. Groundwater recharge resumed, and the water table rose between two and five meters. This enabled cultivation of 100 more hectares of fallow upland. The combined effect of the interventions brought a 30-50% rise in agricultural and livestock productivity. Within three or four years the average family income nearly tripled (1). Ecosystem services became revitalized; tree biomass and carbon sequestration increased, while soil erosion declined.

The project was hailed as a model for increasing land productivity and now WLE, ICRISAT and a consortium of national institutes and local NGOs are expanding the program in about 35,000 ha, with support from Government of Uttar Pradesh (3,4,5). They expect similar interventions adapted to these districts will help the struggling communities revitalize their farms and villages.

Links to any communications materials relating to this outcome:

- <https://tinyurl.com/ybpfg35l>
- <https://www.icrisat.org/niti-aayog-cites-icrisat-watershed-achievements/>
- <https://www.cabi.org/environmentalimpact/ebook/20183333906>
- <https://tinyurl.com/ycu6dvqa>

Part II: CGIAR system level reporting

Link to Common Results Reporting Indicator of Policies : No

Stage of maturity of change reported: Stage 2

Links to the Strategic Results Framework:

Sub-IDs:

- Reduced smallholders production risk

Is this OICR linked to some SRF 2022/2030 target?: No

Description of activity / study: NA

Geographic scope:

- Sub-national

Country(ies):

- India

Comments: This project focuses on the Bundelkhand region in Central India

Key Contributors:

Contributing CRPs/Platforms:

- WLE - Water, Land and Ecosystems

Contributing Flagships:

- F2: Land and Water Solutions for Sustainable Intensification (LWS)

Contributing Regional programs: <Not Defined>

Contributing external partners:

- BAIF - BAIF Development Research Foundation
- BUAT - Banda University of Agriculture and Technology
- ICAR-CAFRI - Indian Council of Agricultural Research - Central Agroforestry Research Institute
- ICAR-IGFRI - Indian Grassland and Fodder Research Institute
- ICAR - Indian Council of Agricultural Research
- Government of Uttar Pradesh (India)

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

Capturing water for recharge of groundwater (reference 2)

Innovations: <Not Defined>

Elaboration of Outcome/Impact Statement:

Based on a successful pilot project (1), WLE/ICRISAT, is scaling out lessons learned previously in the Bundelkhand region in Central India, a hotspot of water scarcity, land degradation, and poverty. Poor groundwater availability and high temperatures result in very low agricultural productivity; and droughts are common. Over 80% of the open wells dry up soon after the monsoon. Many people migrate to cities seeking employment. Cattle husbandry was largely abandoned due to shortages of water and fodder. Under these conditions, integrated natural resources management (NRM) offers a possible solution to enhance groundwater recharge and reduce water scarcity.

Between 2012 and 2016, WLE/ICRISAT and the Central Agroforestry Research Institute (CAFRI) developed a pilot watershed of nearly 1250 ha in Jhansi district. The construction of nine masonry structures and a haveli (traditional water harvesting tank) renovation created a water harvesting capacity of about 125,000 m³. Intensive data on watershed hydrology, cropping system and agricultural productivity were gathered.

The water harvesting and productivity enhancement interventions had significant impacts on water resource availability, incomes and farmers' livelihoods. Water was no longer scarce; both surface and groundwater were in surplus even at the end of summer. A minimum 250,000 m³ of water was harvested annually, enhancing groundwater levels by 2-5m, with an average of 2.5m. The interventions have significantly changed the cropping pattern in both growing seasons (1,2).

The cost of cultivation, especially for wheat and barley, has fallen. Farmers can complete irrigation quicker as they can now pump water for 8-10 hours per day, thereby enhancing labour-use efficiency. By introducing improved cultivars and management practices, average wheat yields increased from 1.7 t/ha to 2.7 t/ha, compounding net profit significantly (1).

The NRM interventions also improved livestock productivity. The number of buffaloes increased from 950 to 1,300 and milk production increased 2-3 L/day/animal. Average household income nearly tripled from Rs. 51,000 (\$715) to Rs. 143,000 (\$2005) per household/year. The project interventions also enhanced ecosystem services in terms of more tree biomass, reduced soil erosion and more carbon sequestration. Moreover, migration levels fell significantly (1,2,3).

Based on this experience, the Government of Uttar Pradesh assigned a scaling up project to WLE/ICRISAT in seven Bundelkhand districts as part of the Doubling Farmers' Income initiative. The project will develop 35,000 ha in all seven districts. WLE/ICRISAT and a consortium of national institutes and local NGOs have begun implementing the project (4, 5).

References cited:

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

1. Kaushal K Garg, Ramesh Singh, Suhas P Wani, OP Chaturvedi, Inder Dev, Mukund D Patil, R Sudi, Anand K Singh, 2018. Improving Water Availability and Diversification of Cropping Systems in Pilot Villages of North and Southern India. In: Corporate Social Responsibility: Win-win Propositions for Communities, Corporates and Agriculture (eds., Wani SP and Raju KV), CABI. Wallingford pp 119-144. <http://oar.icrisat.org/id/eprint/10948>
 2. Singh R, van Noordwijk M, Chaturvedi OP, Garg KK, Dev I, Wani SP, Rizvi J. 2019. Public coinvestment in groundwater recharge in Bundelkhand, Uttar Pradesh, India. In: van Noordwijk M, ed. Sustainable development through trees on farms: agroforestry in its fifth decade. Bogor, Indonesia: World Agroforestry (ICRAF) Southeast Asia Regional Program. pp 197-204. <http://www.worldagroforestry.org/book-chapter/public-co-investment-groundwater-recharge-bundelkhand-uttar-pradesh-india>
 3. NDVI mapping from remote sensing during February represents rabi crop area at Parasai-Sindh watershed before (2010-11) and after (2013-14 and 2014-15) the watershed interventions. Red colour indicates fallow land, whereas green represents cultivated land. With increased groundwater availability, a significant areas of fallow lands were converted into agricultural uses which enhanced resource use efficiency, reduced risk of crop failure, increased crop productivity, total production and income. Maps link: <https://cgiar.sharepoint.com/:f:/s/WLE/Eh9T5yCkK15Ck2-A9xIwFHsBRYHUp22WclfXofYnHp-enw?e=raaTL1>
 4. Masons help farmers harvest rains in Bundelkhand. <http://idc.icrisat.org/idc/index.php/masons-help-farmers-harvest-rains-in-bundelkhand/>.
 5. FICCI (Federation of Indian Chambers of Commerce and Industry). Extract from: Sustainable management of water in agriculture: Compendium of good practices. (Available in Indian Watersheds Folder <https://cgiar.sharepoint.com/:f:/s/WLE/Eh9T5yCkK15Ck2-A9xIwFHsBRYHUp22WclfXofYnHp-enw?e=raaTL1>)
- Promotional products: blogs, outreach materials (cannot be used as evidence but useful for promotion). Links/titles:
6. Niti Aayog cites ICRISAT watershed achievements. <https://www.icrisat.org/niti-aayog-cites-icrisat-watershed-achievements/>. The NITI Aayog which is an apex body of government of India towards policy formation, has cited Parasai-Sindh watershed as one of the best water management practices in year 2019.
 7. Water harvesting brings home migrant farmers. <https://www.icrisat.org/water-brings-home-bundelkhands-migrant-farmers/>.

Quantification: <Not Defined>

Gender, Youth, Capacity Development and Climate Change:

Gender relevance: 0 - Not Targeted

Youth relevance: 0 - Not Targeted

CapDev relevance: 1 - Significant

Main achievements with specific **CapDev** relevance: The intervention includes training of extension officers as well as farmers in improved water, land and crop management. For more evidence, see reference 4.

Climate Change relevance: 2 - Principal

Describe main achievements with specific **Climate Change** relevance: As noted in the text, this intervention enhances ecosystem services through more tree biomass and carbon sequestration, as well as strengthening resilience to climate change. For more evidence, see references 1,2,3,4.

Other cross-cutting dimensions: No

Other cross-cutting dimensions description: <Not Defined>

Outcome Impact Case Report link: [Study #3348](#)

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