



Food and Agriculture Organization
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ACCOUNTING OF WATER FOR IMPROVED MANAGEMENT OF WATER RESOURCES

June 2020

SDGs:



Countries:

Pakistan

Project Codes:

TCP/PAK/3606

FAO Contribution:

USD 150 000

Duration:

18 January 2018 - 31 December 2019

Contact Info:

FAO Representation in Pakistan

FAO-PK@fao.org

Implementing Partners

Indus River Basin Authority (IRSA); Water and Power Development Authority (WAPDA); Space and Upper Atmosphere Research Commission (SUPARCO); and the Provincial Irrigation Departments of the Ministry of Water Resources (MWR).

Beneficiaries

Water management and accounting personnel from the Crop Reporting Service Center Sindh, the National Agriculture Research Center (NARC), the Pakistan Agricultural Research Council (PARC), the Provincial Irrigation Departments of the MWR and the Water and Power Development Authority (WAPDA); agricultural producers dependent on the Indus River Basin System; irrigation managers; and water management practitioners, researchers and policy makers.

Country Programming Framework (CPF) Outputs

Provincial and district sustainable agricultural investment programmes developed and implemented effectively, including value addition to large infrastructure projects (Output 2.1); public and private sector agricultural service providers are able to support sustainable intensification (Output 2.2).



BACKGROUND

Pakistan's population is expected to reach 221 million by 2025 and, coupled with growing impacts of climate change, the country is expected to respond to pressures on limited water resources due to population growth and a growing need for climate resilient livelihoods. As such, federal and provincial Pakistani authorities have recognized the importance of ensuring water availability and access in order to adequately respond to national agricultural, sanitation and industrial needs. Agricultural production is especially important given that the agricultural sector consumes close to 90 percent of all currently available fresh water supplies in the country. While agriculture accounts for the overwhelming majority of water resources used, it is also the sector responsible for producing more than 90 percent of the country's food supply and generating 75 percent of the country's export revenues. Unsurprisingly, agriculture and food production account for 20 percent of Pakistan's gross domestic product (GDP).

Therefore, rural livelihoods are particularly vulnerable to climate-driven water scarcity, given the country's largely arid to semi-arid climate and its high dependency on a single river system: the Indus River Basin System. Despite being the world's largest contiguous irrigation system and the main water lifeline for Pakistan's household consumption, sanitation and economic activities, there is insufficient data on water availability, use and governance specific to the Indus River Basin.

Moreover, a marked increase in the number of private tube wells over the last 30 years has changed underground water pumping modalities. In light of the limited awareness on the importance of joint efforts for water management, the project helped establish these links between different uses of water along multiple sectors and locations around the country. It convened actors to assess water governance through a systems approach, where the concerns and priorities of all stakeholders concerned were reflected and understood by others.

Given rising trends of groundwater exploitation and deteriorating water quality, the project responded to the need for Pakistan's water management initiatives to react to population growth trends, climate change and other priorities arising from the food-water nexus, such as food safety. As such, the technical assistance provided included a series of capacity development, knowledge transfer and programmatic and institutional coordination activities aimed at enhancing federal and provincial water accounting and data collection methods. Likewise, a number of inter-institutional and multi-stakeholder policy and governance coordination workshops were carried out. With groundwater responsible for 45 percent of all irrigation requirements, it is an increasingly important role in meeting the country's food security requirements, hence why the project prioritized its technical assistance on water management for agricultural production in particular.

The Government of Pakistan identified as high priority the development and management of the water sector in the country, a sign of political will and policy momentum that helped the project assess water availability, productivity gaps and responses required as part of the Pakistan New Growth Strategy, which includes sustainable water resource management.

IMPACT

In assessing Pakistan's water availability, consumption patterns and water resource management governance structures in response to rising population growth and climate-induced water scarcity, the project supported federal and provincial authorities in ensuring a more sustainable and holistic management of Indus River Basin resources. To this end, water data collection protocols and mechanisms, as well as updated information systems on water availability, use and governance, were updated and enhanced. The project's contribution towards more timely, regular and reliable production of standardized water data and information shall lead to more evidence-based policymaking for water resource management.

ACHIEVEMENT OF RESULTS

The project's data collection and water resource assessments from a planning, development, distribution and conservation perspective allowed for a broad participation of federal and provincial authorities, farmers associations, water management practitioners, researchers and policy makers. This fostered participatory and articulated discussions that worked towards establishing a common vision on sustainable water resource management.

Similarly, the project's capacity development activities for evidence-based policymaking were made possible thanks to a fruitful coordination between FAO's expertise on water accounting and governance frameworks and the Water and Power Development Authority (WAPDA) on policy coordination support for water allocation, distribution and use, the Indus River Basin Authority (IRSA) on water allocation frameworks at the provincial level and the Space and Upper Atmosphere Research Commission (SUPARCO) on remote sensing and geographic information systems (GIS) for land cover assessments. These partnerships supported the following activities, all of which contributed to Pakistan's contribution to, and reporting of, Sustainable Development Goal (SDG) indicators 6.4.1 and 6.4.2 on water resource availability and use, for which FAO is the custodian United Nations agency.

- By using literature reviews, governmental data sources and expert consultations, carry out multi-stakeholder assessments on water resource availability, use, governance and sustainability specific to the Indus River Basin System.
- In applying the standard water accounting approach Water Accounting Plus, document the key drivers of change for Pakistan's water resource systems, such as climate change, population growth and water-food linkages.
- Facilitate knowledge transfer on water accounting and natural resource management best practises based on the assessments carried out, and document and validate the water data collected and the policy priorities identified.
- Lead a series of training workshops on water accounting protocols, water auditing models and methods, data inputs and their applicability, remote sensing technologies, geographic information systems (GIS) and experimental accounting exercises.

All activities received valuable support from the national project coordinator assigned by the implementing government authorities to support multi-stakeholder discussions. In this respect, all training workshops and assessments convened a variety of stakeholders who raised concerns from two different, yet interconnected, perspectives: those affected by water scarcity and those afflicted by frequent flashfloods.

These efforts led to the joint working paper entitled, *Water Sector Challenges in the Indus Basin and Impact of Climate Change*, which serves as a compendium of inputs for a common vision on the sustainable management of the Indus Basin River System. In light of this, the project's findings will also be instrumental in providing a foundation for the Green Climate Fund (GCF) project proposal entitled, *Transforming the Indus Basin with Climate Resilient Agriculture and Water Management*, thereby further supporting the interconnectivity between water management, resilient rural livelihoods and food and nutrition security in Pakistan.

IMPLEMENTATION OF WORK PLAN

With the support of provincial government authorities in facilitating information exchanges and organizing training sessions with local irrigation departments, all planned activities were successfully completed within the envisioned budget. However, an extension in the project's end date from 31 July 2019 to 31 December 2019 proved necessary in light of delays in obtaining necessary official data. The availability of timely and accurate data had been identified as a potential risk to the project but, given the revised timeline, all activities were successfully completed. Additional time was also necessary to complete the data cleaning, validation and format conversion tasks, which were essential to guarantee robust data analyses and quality assurance standards.

FOLLOW-UP FOR GOVERNMENT ATTENTION

Given the importance of policy linkages between food security, water governance and adaptation to climate change, the assessment reports identified climate change, population growth and the water-food nexus as key factors likely to shape the future of Pakistan's water resource management. In this respect, federal and provincial authorities are encouraged to consider these three factors together for future programmatic coordination and policymaking activities. This would facilitate a common vision and roadmap for sustainable water management.

Moreover, in light of the results on water auditing and accounting, as discussed and validated during the training and stakeholder workshops, the project's implementing partners and federal and provincial authorities involved are reminded that these results are ready to be published through the different federal and provincial information platforms available. The publishing of these results would help respond to the feedback from participants who voiced their need for biannual refresher courses on water accounting and auditing methods, including more detailed training manuals.

In addition, given the project's contributions to the GCF project proposal entitled, *Transforming the Indus Basin with Climate Resilient Agriculture and Water Management*, the federal and provincial authorities concerned are encouraged to continue sharing information through their improved data collection protocols, thus supporting the integration of this project's water accounting and water management contributions into a broader GCF framework of climate-smart agriculture policies and water management governance. Similarly, the water management assessments and trainings workshops helped develop a joint work agenda with the Provincial Irrigation Departments of Punjab and Sindh. This milestone may require follow-up monitoring and scaling-up support to expand the use of accounting methodologies and spatial maps developed for land-use assessments at the hydrological unit and canal command area levels, which can in turn transfer land, water, rainfall and climate data from district to canal command boundaries.

SUSTAINABILITY

1. Capacity development

In light of rapidly decreasing groundwater levels down to depths where water pumping is no longer possible and to the point where saline water intrusion is observed, the project facilitated a series of multi-stakeholder assessments on groundwater availability and use. These efforts helped broker a consensus between federal and provincial authorities, farmers associations and agricultural producers on working together under a common vision for water accounting and management. In this respect, the project contributed to policy and technical coordination around SDG indicators 6.4.1 and 6.4.2 on water-use efficiency and productivity and environmental flows.

Moreover, the training workshops for 26 stakeholders focused on water accounting and irrigation concepts, procedures, technologies, best practices, knowledge transfer modalities for practical tools and guidance frameworks on irrigation and water governance planning and investment.

In addition, given the political will to strengthen water accounting practises at the provincial levels, the project's data collection and technical assistance to foster knowledge transfer and collaborative working platforms were timely. Likewise, existing partnerships with federal and provincial government institutions and other research organizations were strengthened, proving important in addressing water accounting data quality and monitoring obligations.

2. Gender equality

Given the project's institutional support nature, it did not directly respond to specific gender equality priorities. Nonetheless, the project's activities, as supported by all stakeholders, encouraged female participation and remained mindful of the fact that the expected results of these strengthened capacities should reflect and respond to gender-specific deprivations in terms of access to water. As such, the project's training workshops and knowledge sharing platforms helped position the importance of obtaining and acting on gender-disaggregated data, where possible, for inclusive and sustainable water management.

3. Environmental sustainability

Given that sustainable water management depends on the sound analysis of water use and quality, the project successfully mainstreamed in all its activities the potential and need for comprehensive and multi-stakeholder water management structures and programmes. Moreover, in light of accelerating water scarcity trends throughout the Indus Basin River System, the project convened a wide host of actors with different water needs, highlighting the importance of water accounting practices that disaggregate by sector and use an array of productivity metrics.

Therefore, the project contributed to assessments on the equitable use, allocation and distribution of water by sector. These efforts further supported the political will around responsible and inclusive water management in Pakistan, such that canal water depletion, groundwater quality, sustainable after-use modalities, water quality and salt deposits in water sources remained part of national environmental sustainability priorities.

4. Human Rights-based Approach (HRBA) – in particular Right to Food and Decent Work

The project facilitated a wide array of participatory discussions around the common goal of sustainable water management in Pakistan. By including the concerns and recommendations from those affected by water scarcity as well as those vulnerable to torrential floods, all training workshops and national assessment exercises highlighted the right to sufficient, safe, accessible and affordable water from the perspective of different consumption, production and sanitation needs. As such, the project adopted a coherent narrative on the food-water nexus that shall be reflected through policy linkages on clean and safe water, productive, dignified and gainful employment and the right to food for all. Moving forward, these improved water accounting capacities shall allow for more judicious water management policies from a rights-based approach.

5. Technological sustainability

The project's capacity building and programmatic coordination activities contributed to Pakistan's sustainable agriculture intensification and natural resource management priorities. These efforts also helped identify at-risk areas that may require provincial and district-level water management investment programmes and multi-stakeholder surface water management strategies.

In working to this end, the 26 technical officials trained from the Crop Reporting Service Sindh, the NARC, the PARC, the WAPDA, Provincial Irrigation Departments of the Ministry of Water Resources (MWR) and research organizations are positioned to engage in, and advocate for, evidence and data-based policy making for water management, with an emphasis on water for agricultural production. Consequently, this group of technical personnel represents a national pool of experts, whose knowledge base can be used in a decentralized training-of-trainers modality moving forward.

6. Economic sustainability

The project ensured that all land, water, rainfall, climate and satellite imagery information used during the trainings were made available to the public through an online platform, thus encouraging as wide an audience as possible to benefit from the results obtained. This shall encourage government stakeholders, private sector representatives, researchers and practitioners to take advantage of this access to and affordability of information.

In terms of ensuring the continuation of the project's activities and scaling up its results, the project's support to federal and provincial water accounting and auditing protocols will contribute to developing the GCF project proposal entitled, *Transforming the Indus Basin with Climate Resilient Agriculture and Water Management*.



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DOCUMENTS AND OUTREACH PRODUCTS

- ❑ *Water Sector Challenges in the Indus Basin and Impact of Climate Change*. Working Paper. Z. Habib, A. Heures, H Kanamaru, A. Pervaiz, R. Wahaj, A. Wajid-Rana. Islamabad. 2019. 38 pp.
- ❑ *Transforming the Indus Basin with Climate Resilient Agriculture and Climate-smart Water Management*. Press release. FAO Representation Office in Pakistan. 2018. 1 pp. <https://bit.ly/2YNZ4mP>.



ACHIEVEMENT OF RESULTS - LOGICAL FRAMEWORK

Expected Impact	Enhanced national capacity in planning and development of country's water resources contributing to sustainable rural and agriculture development		
Outcome	Sustainable management of Indus water resources as Government institutions adopt surface water management strategies		
	Indicator	1. Number of strategy papers and/or frameworks developed on improved surface water management. 2. Number of assessments conducted on surface water resources (Output 1). 3. Number of stakeholder staff skilled in water accounting and auditing (Output 2).	
	Baseline	1. 0 2. 0 3. 0	
	End Target	1. 1 2. 1 3. 20	
	Comments and follow-up action to be taken	The water management assessments and training workshops helped develop a joint work agenda with the Provincial Irrigation Departments of Punjab and Sindh in order to develop a methodology and set of spatial maps for land-use assessments at the hydrological unit and canal command area levels. This methodology can be used to transfer any set of land, water, rainfall and climate data from the district boundaries to the canal command boundaries. These efforts should receive the necessary monitoring and scaling up support moving forward. Moreover, as a result of the national water management assessment reports and the training and validation workshops on water accounting and auditing, the food-water policy nexus was better defined. In this respect, the working paper entitled, Water Sector Challenges in the Indus Basin and Impact of Climate Change was prepared, representing a technical compendium of synthesized inputs that can guide technical personnel and policymakers in working towards a common roadmap for sustainable water management.	
Output 1	An assessment report available for decision makers on surface water resources (availability, use, and water productivity) of Indus river basin in Pakistan		
	Indicators	Target	Achieved
	Number of assessments conducted on surface water resources.	1	Yes
Baseline	0		
Comments	The assessment report included key considerations and implications of climate change, population growth and the water-food nexus as factors that are likely to shape the future of Pakistan's water resource management.		
Activity 1.1	Assessment of Water Use, Availability and Productivity		
	Achieved	Yes	
	Comments	Multiple assessments were conducted at the federal, provincial and canal levels, following a comprehensive literature review and desk research. In addition, all assessments were supported by external expert opinions and consultations, which helped all participating stakeholders reach an agreement on a standardized water accounting approach. Two challenges encountered during these assessments were the unavailability of data at the correct and sufficiently detailed hydrological unit, and the differences in land use maps between canal command areas. However, the project's close working relationship with the Provincial Irrigation Departments of the MWR helped address these challenges in a timely manner.	

Output 2	Improved knowledge base and information on water resources disseminated		
	Indicators	Target	Achieved
	Number of stakeholders staff skilled in water accounting and auditing.	20	Yes
Baseline	0		
Comments	The training and stakeholder workshops created a pool of local experts who represent a potential knowledge base that can be used in a decentralized training-of-trainers modality in the future. In addition, the results on water auditing and accounting methods and water management analyses discussed during the training workshops (as per Activity 2.1) were validated (as per Activity 2.2.) and are ready to be published through the different federal and provincial organizations concerned.		
Activity 2.1	Training Workshop		
	Achieved	Yes	
	Comments	<p>In an effort to strengthen the capacities of relevant stakeholders directly involved in water management, a five-day training session on water auditing and accounting principles took place from 25 February to 1 March 2019. A team of national and international experts delivered the training sessions to 26 participants on the following topics.</p> <ul style="list-style-type: none">- Comprehensive introduction to water accounting protocols and methods;- Water accounting models and their applicability;- Remote sensing technologies and GIS for water use monitoring;- Water auditing models and methods;- Data inputs and their applicability; and- Participatory and experimental exercises. <p>The participants came from the Crop Reporting Service Sindh, the NARC, the PARC, the WAPDA, the Provincial Irrigation Departments of the MWR and research organizations. These training served to build technical capacities to enable this group of experts to apply their acquired skills into the promotion of judicious and evidence-based policy making for agricultural water management in water scarce areas.</p>	
Activity 2.2	Stakeholders Workshop		
	Achieved	Yes	
	Comments	<p>The stakeholder workshops took place in Islamabad, Lahore and Karachi, and served to present stakeholders with the water auditing and accounting methodologies tested and supported, followed by the presentation of the preliminary results for their validation.</p> <p>As part of these workshops, the Provincial Irrigation Departments of the MWR and the WAPDA agreed to adopt two water accounting and auditing methodologies into their work.</p>	

Partnerships and Outreach

For more information, please contact: Reporting@fao.org

Food and Agriculture Organization of the United Nations

Viale delle Terme di Caracalla

00153 Rome, Italy