

Augmenting Water Security and Food Security of Small Farmers in Andhra Pradesh, Karnataka and Tamil Nadu



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The GWP Network is open to all organizations that recognize the principles of integrated water resources management endorsed by the Network. It includes states, government institutions (national, regional, and local), intergovernmental organizations, international and national non-governmental organizations, academic and research institutions, private sector companies, and service providers in the public sector.

The Network has 13 Regional Water Partnerships, 85 Country Water Partnerships, and more than 3,000 Partners located in 182 countries.

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1. Background

In South Asia, Global Water Partnership (GWP) has been tackling the mounting challenges of climate change through the Water and Climate Resilience Program (WACREP) since 2013. WACREP includes a portfolio of programs and projects aiming to build climate resilience through implementation of Integrated Water Resource Management (IWRM). The programs and projects are developed by GWP's Country Water Partnerships (CWPs) in collaboration with respective governments/agencies, international and regional economic development communities and citizens.

2. Introduction

2.1. Water Scarcity in South India

Across India, the magnitude and intensity of extreme weather events like drought and floods is increasing. Such changes in climatic conditions affect a myriad of issues like food security, water logging, deterioration of quality of soil and interstate disputes for water among others. Of these, access to water for drinking and domestic purposes and for agriculture affect farmer communities in South India the most, as majority of Indian farmers are dependent on rain fed agriculture. In addition to human well-being and livelihood security, both drought and floods indirectly affect many other income-generating activities.

Over the last few years, the amount of precipitation in South India has reduced, in part due to climate change. Increasing variability in rainfall distribution and magnitude pose a major threat to agricultural productivity in particular to rain fed farming - a prevalent practice across India. India ranks first among rain fed agricultural countries of the world in terms of extent and value of produce.(Sharma, Rao, and Vittal 2009). High population pressure on agricultural lands leads to higher concentration of poverty in the region due to water scarcity for rain fed crop production often leads to crop failure or underwhelming production. In addition, over exploitation of resources in the rain fed ecosystems has resulted in depreciation in the quality of natural resources (Venkateswarlu 2011).

2.2. Traditional Water Harvesting Structures in South India

For many centuries, traditional water harvesting systems across India have met the water demand of the local population. Any method for inducing, collecting, storing and conserving local surface run-off for future productive use represents a sustainable solution given regular rainfall. In fact, areas where low rainfall is observed can be ideal locations for rainwater harvesting as they augment the storage capacity of the area from the baseline.

While the complexity of rainwater harvesting systems varies, in South India every village had at least three water bodies for drinking and farming needs (Bhattacharya 2015). Integrated Water Resource Management (IWRM) on a small scale that treats water as a recyclable resource is a core theme of traditional Indian systems, and can be witnessed through the existence of irrigation tanks, ponds and other small water storage structures (Kapadia 2009).

Creation of a small water body generates several benefits such as groundwater recharge, improving water quality, increasing green cover in the surrounding areas and acting as a control against floods

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and excess runoff. In the process, it reduces soil erosion and silting of rivers (Kapadia 2009). These are also seen as agents that can help mitigate the adverse impacts of climate change and result in improved water and food security in South India.

Traditionally, water resource management was carried out differently in various parts of South Asia though similar practices were common, which are highlighted as below:

- Andhra Pradesh: Andhra Pradesh, lying in the Deccan Plateau traditionally created reservoirs to store runoff called *Cheruvu*. Additionally, irrigation tanks, wells and village ponds have also been in use since ancient times.
- Karnataka: Karnataka is well known for its variety of wells and tanks. Kolar (targeted district) has the largest number of open wells. Belgaum is in second place with Bijapur (targeted district) occupying the third place (Iyengar 2007). The highest number of wells and tanks were located in Kolar district, where records indicate that there were more than 60,000 water bodies historically.
- Tamil Nadu: Constrained availability of large open spaces and irregular topography lead to construction of small tanks for individual use. Traditionally, village assemblies built *Ooranies* or surface water collection ponds from an improved catchment, which were maintained by local communities. Donating land for ponds or assisting in digging a pond was considered virtuous. Women benefitted most from using *Oorani* water as they no longer needed to fetch water for domestic needs from far distances (Kapadia 2009). *Ooranies* are suitable especially when the vadose zone is too narrow with or without an unconfined aquifer and massive hard rock underlying the sandy overburden. Tamil Nadu has the maximum number of *Ooranies* in the country. The depth of the ponds are ideally 3-5 m (Ministry of Drinking Water & Sanitation 2015).

3. Description of the Problem

In recent times, a drastic depletion of water levels is observable in the target states of Andhra Pradesh, Karnataka and Tamil Nadu in South India. Over the years, the situation has worsened with majority districts suffering from acute water shortage, which has led to conflict, rising cases of farmer suicides and inter-state conflicts for access to water. Simultaneously, lack of ownership from authorities in charge of maintenance and protection of water harvesting structures and apathy from the local population who use (d) these services has led to a breakdown of these structures that help provide a counter-balance to water shortages (Iyengar 2007).

Since the 19th century, traditional systems of rainwater harvesting have been in decline, catalysed by the colonial rule. While India was colonized, the British administration lacked understanding of these systems and wanted to be the provider of water taking over the management and ownership of water bodies. This attitude of lax management continued post-independence in 1947; combined with an increase in urbanization it led to the destruction of water bodies (Ganga Trust, n.d.).

In the targeted water-starved regions of southern peninsular India (Andhra Pradesh, Karnataka and Tamil Nadu), acute shortage of drinking water is a common phenomenon every year. The ground water is saline and unfit for drinking and irrigation. Traditionally, surface drinking water ponds or *Ooranies* maintained and nurtured over generations by local communities have been the source of water needs for millions of people in this region. Breakdown of community management and poor

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maintenance have made these water bodies lose their efficacy. Typically, people have to walk 3-5 kilometres to fetch water, and the burden falls mostly on women.

Harvesting and storing rainwater is a feasible, low-cost sustainable solution using history as a reference. While there have been isolated attempts to revive rainwater harvesting structures, the problem has not been tackled in a systematic manner across the region. Heavy downpour in a few days is caused by climate change and water-harvesting structures can help compensate its effects. The water stored can be used for irrigation and creates space for farmers to engage in diversified cropping. Besides irrigation, farm ponds can be used for fodder production for livestock, raising vegetable crop on its bunds and for fish rearing.

3.1. DHAN Foundation

The DHAN Foundation initiated an action research project in 1992 for regeneration of farmers' management of tank irrigation systems, which laid the foundation for 'Vayalagam Tank-fed Agriculture Development Program'. Under this program, isolated tanks are converted into tank-based watersheds that support chains of tanks in minor river basins to achieve manifold impacts of the renovation and restoration works. This allows DHAN to evolve scalable models for community-led conservation and development of traditional water resources, creation of drinking water ponds and low-cost household level water treatment methods.

DHAN Foundation has been promoting a people led conservation movement called 'Vayalagam (Tank Conservation) Mutual Movement' started by Shri Anna Hazare in 2002 in Madurai, Tamil Nadu. DHAN lays emphasis in building social capital for reviving the age-old practice of community management called *kudimaramath*. It organizes farmers and farm labourers dependent on each tank into Vayalagam Associations, networks them at the cascade level (chain of tanks linked hydrologically) and federates them at the block or district level to take up conservation drives on a large scale, as well as builds alliances with private, public and non-profit organizations working on tank systems. (DHAN Foundation 2006)

At each level of the farmers' federation, leaders have emerged from local communities. They work tirelessly to further the restoration drive. What DHAN has achieved in the process is to hand over the entitlement for managing and use of water in these tanks to the people at the grassroots, which was the practice in India for centuries, until the British rule when all these structures were taken over by various levels of governmental agencies. Through DHAN's initiative, this has been reversed with people now taking charge of their water resources.

Through the Vayalagam Farmer Organizations, DHAN facilitates rehabilitation of tanks for restoring physical structures to their originally designed standard, but more importantly, facilitating the proper maintenance of the tanks, efficient water management and implementing improved cropping practices in a sustainable manner. Vayalagam institutions have always insisted on farmers contributing one fourth of the cost of rehabilitation through monetary or labour contribution. Rehabilitation of irrigation tanks to their original storage capacity increases availability of water for more area for cropping. Earlier all these tanks and the command area were facing the problem of water shortage towards the end of the cropping period, as tank water was inadequate to provide adequate water for even a single full crop.

4. Decisions and Actions Taken

DHAN Foundation with its extensive experience in rainwater harvesting structures was identified as the ideal partner organization to carry out this Water and Climate Resilience Program (WACREP) initiative in India with support of India Water Partnership (IWP/GWP-India). The main objectives of the study were:

1. To map and assess the impacts of climate change, understand the local adaptation of best practices, incorporate risk mitigation/reduction and develop strategies based on indigenous and scientific knowledge by involving key stakeholders.
2. To rehabilitate irrigation tanks to help farmers in target villages of Tamil Nadu cope with increasing climate variability.
3. To construct farm ponds in hydrological appropriate sites to minimize the risks faced by rain fed farmers in Andhra Pradesh and Karnataka.
4. To provide access to potable water by deepening drinking water Ooranies and combat salinization of aquifers in coastal villages of Tamil Nadu.

In addition to carrying out the project interventions, DHAN Foundation also hosts the South Zonal Water Partnership (SZWP). IWP/GWP India also aids in facilitating water harvesting training programmes through SZWP and has been working with DHAN Foundation since 2009. DHAN Foundation is a very active partner of IWP and for any programmatic intervention in the South Zone IWP relies on DHAN Foundation.

With DHAN Foundation as the primary implementing agency, IWP/GWP-India had the role of bringing all the stakeholders at one platform and conducting programmatic monitoring and evaluation. Accordingly, IWP team facilitated and also participated in focus group discussions and carried out monitoring and evaluation of the interventions.

Project Approach:

DHAN Foundation as a partner organization to IWP/GWP-India helmed the WACREP sponsored program to increase food and water security of highly vulnerable farmers, women and landless households in the southern states of Tamil Nadu, Andhra Pradesh and Karnataka in India from October 2013 – March 2015 (for a total of 18 months). Through the rehabilitation of 4 irrigation tanks in Tamil Nadu, construction of 17 farm ponds in Andhra Pradesh (11) and Karnataka (6) and deepening of 3 Ooranies in Tamil Nadu, it was aimed that climate resilience of affected communities will be raised as a result.

The villages and beneficiaries were identified from two different agro-climatic zones (coastal and rural ecosystems) to gauge variabilities in adaptation to climate change. The project targeted 10 villages in seven districts across three southern Indian states: Ramanathapuram, Madurai, Sivagangai and Virudhunagar districts in Tamil Nadu, Chittoor district in Andhra Pradesh; Kolar and Bijapur district in Karnataka.

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4. 1. Promoting Social Capital for Climate Change Adaptation

DHAN Foundation's extensive experience in organizing the unorganized to address climate risks and raise resilience of farming communities in South India is achieved through informal association of community members with a written by-law, a bank account operated by joint members including a President, Secretary and Treasurer, and regular monthly and annual governing body meetings. In order to mobilize action, rapport building with beneficiaries in identified villages is essential and is accomplished by the promotion of a Vayalagam – a farmer federation that overlooks water tanks and structures that are already in place or newly set up through *gram sabha* or village council proceedings.

Awareness raising meetings were organized in all the targeted villages to establish trust with the community and educate them about the project's purpose. Issues like climate change and the impacts faced at a village level, present coping strategies adopted by them and proposed activities under WACREP were discussed. The IWP team carried out continuous monitoring during programmatic implementation of this initiative and engaged with community groups during participatory exercises.

For project implementation, villages facing high climate risks were approached and their needs were identified. Climate smart solutions were contextualized and physical rehabilitation work like clearing of land, construction of structures, and dredging of sand in *Ooranies* was conducted through the association in the respective villages. **This project promoted 10 Vayalagams covering 811 families.**

Table 1: Details about Vayalagams supported by IWP during WACREP initiative (IWP/GWP-India, 2015)

No.	Name of the Vayalagam	Name of the Village	Households affected
1.	Jai Anjanaye Keremathu Jalanayana Abhivrudhi Sangha	Vittal Nagar	60
3.	Sri Sevalal Vayalagam Sangha	Bardol Tanda	90
3.	Mallikarjuna Vayalagam	Bardol	98
4.	Sri Seddeswara Vayalagam	Godihal	84
5.	Mugavur Vayalaga Sangham	Mugavur	130
6.	Alwarkootam Oorani Vayalagam	Alwarkootam	71
7.	Narayanathevan Oorani Vayalagam	Rajakkal Kudiyiruppu	50
8.	Ranisethupuram Oorani Vayalagam	Rani Sethupuram	175
9.	Poovakani Tank Vayalagam	Poovakani	28
10.	Kurinjankulam Kanmoi Vayalagam	Veppankulam	25
Total			811

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Image 1. IWP Monitoring and Evaluation team interacting with the village community

4.2. Rehabilitation of Irrigation Tanks in Tamil Nadu

Irrigation tanks are earthen-bunded freshwater storage structures that take advantage of the rolling topography found in South India. Relying on traditional indigenous knowledge, they serve multiple purposes for community members – they act as flood moderators and drought mitigators and act as a climate smart tool to intercept runoff and store water for use beyond the monsoon season. Despite their old history, lack of local management, public and/or public investment to revive them for optimal functioning and conflicts among villages and villagers have served as major impediments to their healthy functioning.

Under WACREP, DHAN Foundation completed the rehabilitation of four tanks in Mugavur, Alwarkootam, Poovakani and Kurinjankulam in Tamil Nadu. The project team conducted participatory tank appraisal, obtained no objection from the Block Development Officer (BDO) and/or village panchayat, mobilized 20-25% cost of rehabilitation as cash from the benefitted families as their monetary contribution and an additional 10% contribution by way of voluntary time and labour for rehabilitation work.

All the four tanks were of different size and were built to the requirements of the target community, who raised nearly **27% of the cost** and volunteered their services during the construction process. Collectively, the tanks enhanced the storage capacity of the region by **6,650 Cu. M** with clearing of nearly **2,500 m** of water supply channel to guide the water to tanks from their respective rainwater catchments. Nearly **1000 people (550 male, 450 female)** from the villages targeted benefited from this initiative.

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Image 2. Pictorial representation of feeder channel at Mugavur Kanmoi village, Virudhnagar District, Tamil Nadu

Table 2: Physical Natural Resources Capital Formed (IWP/GWP-India, 2015)

No.	Name of the Work and Village	WACREP Grant (INR)	People Contribution (INR)	Total (INR)	Storage Capacity (Cu. M)
1.	Desilting supply channel, eviction of encroachment, selective deepening of tank bed, Mugavur Kanmoi, Narikudi Block, Virudhunagar district.	1,12,800	16,700	1,29,500	1,500
2.	Alwarkootam Tank dead storage and pond in tank system to cope with water scarcity, Alwarkootam, Tirupulani block, Ramanathapuram district.	1,00,000	48,000	1,48,000	2,000
3.	Poovakanikanmoi repair to tank sluice, selective desilting of tank bed, Poovakani, Manamadurai block, Sivagangai district.	53,000	25,000	78,000	1,350
4.	Desilting supply channel and deepening tank bed of Kurinchakulam Kanmoi, T. Veppankulam Panchayat, Tirumangalam block, Madurai district.	1,00,000	50,000	1,50,000	1,800
Total		3,65,800	1,39,700	5,05,500	6,650

4.3. Construction of Farm Ponds in Palar Basin, Andhra Pradesh and Karnataka

While well-off farmers react to changes in the climate by adopting technological coping mechanisms or shifting professions, low and middle-income farmers are left highly vulnerable. In such situations, farm ponds owned by individual families augment coping and resilience capacity of vulnerable farmers by reducing crop losses and supporting agricultural activities as well as providing a safety net to avoid hunger and poverty.

In the projects funded by other agencies like European Union, GIZ, Oxfam-Novib, CSR projects, DHAN Foundation has executed over 2000 farm ponds to cope with climate stress in view of the vagaries of monsoon. On an average, each farm pond has a capacity of storing **450 – 700 Cu. M**, which is sufficient to support supplementary irrigation for a second crop in normal rainy season

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and/or protective irrigation during times of monsoon failure or water scarcity. In total, **about 8,750 Cu. M of water storage potential** was created in the farm holdings because of this intervention.

The farm ponds are dugout earthen ponds, which can be lined with locally available materials and clay packing at their bottom to minimize seepage losses. The works were done using earthmover named JCB or Proclain. The hiring cost practice was based on an hourly rate. With these arrangements, each farmer ensured the required turn out in Cu. M. was achieved. In case of excess cost, the respective farmer had to bear the expense, which ensured that they worked vigilantly and provided the needed supervision.

Each farm pond caters to need-based irrigation of farmers with farm holdings of varying sizes ranging from **1-3.5 ha**. The size of the pond was based on the catchment at farm level and landholding size. Under WACREP, DHAN Foundation completed the construction of 17 farm ponds – 11 in Chittoor district of Andhra Pradesh and 6 in Karnataka. **3.2 lakh INR (10 lakh = 1 million)** were disbursed to 17 small/marginal farming families for the construction - each family contributed 25-50% cost to the process. **17 families (~ 135 people)** were directly benefited in the process.

The Dhamasha system is one of the oldest water sharing methods traditionally used for agriculture, which ensures a mutually beneficial agreement for all farmers. When a water shortage is faced, the system is enacted and a minimum quantity of water that is adequate for crops to grow in is distributed to each stakeholder. This practice is still prevalent in some villages of Kolar District- one of the targeted districts in Karnataka (Iyengar 2007).

4.4. Deepening of Drinking Water Ooranies in Tamil Nadu

In coastal areas in South India, surface water ponds created primarily for the provision of drinking water are called *Ooranies*. An ancient traditional water storage structure, *Ooranies* are typically adequately protected from animals and have some sort of protection, which restricts access. In recent times, a rise in the salinity level in the groundwater has been noted, which makes water non-potable and reduces the stock of potable water accessible to village communities.

Under WACREP, DHAN Foundation carried out the deepening of three drinking water *Ooranies* at Kadambankulam village in Virudhunagar district, Ranisethupuram village in Ramanathapuram district and at Rajakkal Kudiyiruppu in Sivagangai district. The completed *Ooranies* filled with water provided clean drinking water to nearly **595 families** throughout the year. This intervention negated the need for women to travel to far off distances to fetch water for domestic uses and was seen as a positive initiative from the perspective of affected communities.

In each *Oorani*, approximately **1500-2000 Cu. M** water storage potential was created based on post work measurement of length, breadth and depth. Considering significant rural to urban outmigration, average households comprised of 3-4 members. Taking three members per household as a conservative estimate, nearly **1,785 direct beneficiaries** were touched by this intervention.

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Image 3. Renovated Ranisethupuram Oorani with a bore well in Ramanathapuram District, Tamil Nadu

Image 4. Kadamangalam Village Oorani, Ramanathapuram District, Tamil Nadu

Table 3: Details about Ooranies in Tamil Nadu (IWP/GWP-India, 2015)

No.	Name of the Oorani, Village, District	WACREP Grant (INR)	Community Contribution	Number of families benefitted
1.	Kadambankulam Oorani, Kadambankulam, Virudhunagar	1,20,000	40,000	170
2.	Ranisethupuram Oorani, Ranisethupuram, Ramanathapuram	1,67,250	62,750	375
3.	Narayanathevar Oorani, Kadayam, Tirunelveli	1,00,000	79,000	50
Total		3,87,250	1,81,750	595

5. Outcomes

1. Promoting Social Capital: The team promoted 10 Vayalagams under WACREP besides taking up project activities in already functioning Vayalagams. About 811 household units in the project locations were organized into social capital of community institutions.

2. Rehabilitation of Irrigation Tanks: DHAN Foundation completed the rehabilitation of supply channels, tank bed deepening, construction of ponds inside a tank bed, repair and improvement to tank sluices in four irrigation tanks in Tamil Nadu. About 10,000 Cu. M of water augmentation potential was created in addition to clearing 2500 meters of water supply channel to guide the water to tanks from their respective rainwater catchments. During observation phase, the actual water capacity was assessed to be 6,500 Cu. M. During a normal rainy season, the tanks may fill more than once based on the size of catchment and rainfall. Hence, both actual measurement and original calculated field level storage capacity is underscored in this study.

3. Construction of Farm Ponds: Farm ponds play a vital role in harvesting untimely as well as poorly distributed monsoon rains. This helps farmers protect their crops during drought and water scarce periods. Under WACREP, DHAN Foundation constructed 17 Farm ponds in Andhra

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Pradesh and Karnataka in South India. About 8750 Cu. M of water storage potential was created in the farm holdings benefitting 17 households comprised of nearly 135 people.

4. Deepening of Drinking Water Ooranies: Under WACREP, DHAN Foundation selected three villages facing acute drinking water shortages. Due to this, the women of these villages faced the problem of having to fetch drinking water by walking long distances. To cope with this situation, DHAN Foundation completed three drinking water Ooranies. About 595 families gained access to clean drinking water as an outcome. In each *Oorani*, approximately 1500-2000 Cu. M water storage potential was created to harvest clean rainwater during North East monsoon in order to meet the drinking water needs of three villages.

Beneficiaries

Under WACREP, 811 families were directly benefited by the implementation of this project. 550 additional families were indirectly benefitted because of the benefits of water storage that were delivered to them by direct association with the beneficiaries. In total, 1,361 households (roughly 4,570 individuals) had accessed to improved sources of water.

Table 4: Details of beneficiaries positively influenced by this project (modified from IWP/GWP-India, 2015)

No.	Activity	Region affected	Number of households	Number of people affected
1	Rehabilitation of Irrigation Tanks (a)	Tamil Nadu	199	1000
2	Construction of Farm Ponds (b)	Andhra Pradesh, Karnataka	17	135
3	Deepening of Ooranies (c)	Tamil Nadu	595	1785
Direct Beneficiaries from Vayalagams (a + b + c)			811	2920
Additional number of families benefitted (d)*			550	1650
Total number of beneficiaries (a + b + c + d)			1361	4570

*A simplifying assumption of three members per household has been made for the calculation of additional number of families benefitted.

6. Lessons Learned

Over the course of the implementation of this project from October 2013 to March 2015, learnings about the impact of the interventions and recommendations about the replicability of such endeavours were collated, which are expressed below:

- Community participation with contribution and consensus for implementation of context specific climate smart activities ensures success and builds resilience in climate-risk communities.
- Collaboration and full-fledged support from the government and village panchayat is needed to evict encroachments in waterways, water bodies and agriculture lands.

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- The management of water resources for diverse uses should be done by adopting a participatory approach; by involving the user communities (youth, women and farmers) through community based organizations like Vayalagams, in the various aspects of planning, design, development and management of water resources (Kathpalia and Kapoor 2002).
- Even in deficient rainfall conditions, *Ooranies* can supplement the drinking water demand for many months. They help in groundwater recharge, increase water levels in wells and help improve the quality of water in the area nearby (Ministry of Drinking Water & Sanitation 2015).

Recommendations:

- Traditional and natural wetlands and water bodies like tanks, *jheels*, *chors* and village ponds, etc. have been badly neglected in the last few decades. These structures should be restored, maintained and used properly and these water bodies should not be allowed to be encroached upon for any other land use (Kathpalia and Kapoor 2002).
- Interventions made under WACREP by DHAN Foundation and IWP/GWP-India in the project states could be scaled up by State Governments and other relevant development organizations with adequate fund allocation. Community-centric development work ensures sustainability and hence it should be the mandate for scaling up.
- Supported by organizations like DHAN that can provide technical expertise and help communities in carrying out such projects, such initiatives can be replicated in other parts of India where traditional water structures have fallen into disrepair. Post competition communities have the onus of maintaining such services so it is crucial that they are self-motivated and driven.
- Climate financing and other appropriate financial tools in semi-arid tropics could be piloted for mitigating climate risk and building resilience among rural poor. Global Water Partnership-South Asia (GWP-SAS) could suggest relevant climate mitigating factors since WACREP activities are most suitable in these agro-climatic situations.
- GWP-SAS and IWP/GWP-India should integrate the Sustainable Developmental Goals in future projects proposals for similar activities in South Asia (dry north zones of Sri Lanka, five Southern Indian States and Nepal).
- Budget constraints and poor community participation make the tank performance unsustainable. The immediate solution is to identify appropriate investment strategies and make local *panchayats* responsible for the operation and maintenance of the tanks. For this, resource mobilization and people's participation is very essential (Ranjan and Arya 2008).

7. Conclusion

In 2016, India faced the worst drought in the last 140 years since 1876 (as per Indian Meteorological Department). Despite the average monsoon being insufficient to cause filling and storage, water-harvesting structures built by DHAN provided some relief to villagers in South India. Since tanks were desilted and maintained well, some water was available for irrigation and helped in groundwater recharge. This was evident in villages in the Gundar basin where, even after a failed monsoon, many individual dug wells retained water and helped augment water

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supply. Regular monitoring showed that the infrastructures were either partly filled or empty. Nevertheless, recharge of ground water helped farmers meet their daily demands.

IWRM tools were used extensively in the planning, operation and management of this WACREP intervention. Apart from an enabling environment created by DHAN Foundation and the village councils, institutional tools were central in the execution of the project. The major IWRM tools used were:

- Information gathering and sharing networks (B4.01)
- Community-based water supply and management organizations (B2.03)
- Stakeholder analysis (C3.02)

Leveraging institutional arrangements like Vayalagams and collaborating with village councils ensured sustainability. The Vayalagams collaborate with village councils to work in a transparent and open manner regarding decisions that affect the entire community. DHAN helps provide Vayalagams genuine recognition and legal status, which allows them to function properly. In remote villages, the success of such community-based supply organizations compensates for the lack of public and private water supply schemes.

In targeted communities, Water User Associations (WUA) and Farmer's Federations – Vayalagams – have actively managed small-irrigation schemes. By providing them ownership, projects costs are reduced and programme efficiency is increased as it promotes stakeholder engagement. DHAN worked to educate members about climate change and other topical subjects that affect their livelihoods, which helps level the playing field between stakeholders in terms of information, knowledge and expertise. By clearly identifying stakeholders and their needs at an early stage, stakeholders had an active role in the planning and implementation processes.

The social capital promoted for and around the natural capital as per the mandate and institutional design take responsibility to ensure sustainability. The Vayalagam federations would ensure regular maintenance and upkeep of the system. Every year, the members of Vayalagams would undertake voluntary *shramdhan* (volunteer physical labour) and tap resources from the local village panchayat for continued maintenance and successful functioning of natural capital of water commons created with the funding support of GWP-SAS.

The farmers mentioned that the WACREP Project was timely and was an appropriate strategy to combat climate change risks. The farmers expressed their sense of gratitude to IWP/GWP-India and GWP-SAS.

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10. Supporting References

The full report can be downloaded from IWP website: www.cwp-india.org under WACREP Phase-I Project Reports under Work Package 5.

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