ENSURING FOOD SECURITY AND COMMUNITY HEALTH THROUGH DROUGHT MITIGATION

Gravis

IDRF
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International Development and Relief Foundation

Ensuring Food Security and Community Health through Drought Mitigation

A study of project interventions

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2017

Writtn & edited by
Neetu Sharma

Organized by

Gramin Vikas Vigyan Samiti (GRAVIS)

3/437, 458, M.M. Colony, Pal Road
Jodhpur – 342 008, Rajasthan, INDIA
Phones: 91 291 2785 317, 2785 116
Fax: 91 291 2785 116
E-mail: email@gravis.org.in
Website : www.gravis.org.in

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FOREWORD

Droughts, food security and community health are so closely intertwined. It is a vicious cycle that has been impacting communities for a long time in Thar Desert of India and in many other arid regions of the world. Droughts cause deep rooted and chronic poverty resulting into impeded socio-economic development. The evidence of droughts' impacts on community development is sound and clear. Yet, droughts lack the attention and priority they should get in developmental policies and dialogues.

GRAVIS based in the Thar Desert of India has been addressing droughts since its inception. Over the last three and a half decades, we have understood the droughts with an in-depth analysis, have developed partnerships with the desert communities and with external stakeholders and have innovated and invented designs and technologies to mitigate droughts. Over work reaches out to about 1 million people in Thar and we have been able to share our learning with many other desert communities around the world.

We are very pleased to be in a partnership with the International Development and Relief Foundation (IDRF), Canada through which we are implementing a holistic intervention looking at food security, community health and drought mitigation in Jaisalmer, India. The project is supporting communities in a very remote landscape, living under severe poverty.

This document is a collection of our learning of the above mentioned project. The idea behind documenting this learning was to share what goes well and what does not under such projects. As a possible outcome, we envision improving on our drought mitigation approach in future, as well as to leave a document for other organizations and stakeholders in the form of a guide.

I sincerely thank Dr. Neetu Sharma for leading this study and the members of GRAVIS team and of our communities for their cooperation and support. A special word of thanks goes to our partner IDRF in Canada for their financial support, guidance and encouragement.

Prakash Tyagi
Executive Director, GRAVIS

AUTHOR'S NOTE

Communities in remote villages of Jaisalmer District in Western Rajasthan are exemplar of unrelenting resilience. The dichotomy of being a global tourist attraction on one hand and home to most impoverished population on the other define the social economy of Jaisalmer. Villages located far from district headquarters are not only oblivion from the economic activities at the population destination, people living in these areas also remain excluded from any efforts made by government authorities to enable any services and support.

GRAVIS' efforts to address acute and constant scarcity of water in remote villages of Western Rajasthan have been based on the principle of sustainability and economy and are inspired from indigenous knowledge. The impact of rainwater harvesting that has come to be accepted as most sustainable and climate change responsive strategy to address water shortage, can be seen on improved agricultural productivity, food security and better nutrition.

Health conditions in this region are also improving steadily that is a direct consequence of better hygiene and safe water for drinking. However, community ownership of all these endeavours, improvement in socio economic status of women and opportunity for education are larger issues that have been addressed.

The need for continuing these efforts and replicating them in similar context still exists. Going forward a herculean task awaits for GRAVIS to reach out to all the remotely located villages and hamlets of the Thar in Western Rajasthan and support the communities by ensuring water and food security, and move towards a larger social change.

Neetu Sharma

I - DESERT LIFE

Irrespective of the region of the world one is located in, survival of humankind is largely dependent on access and availability of sufficient water for drinking, household use and for agriculture. Documented history has been full of narratives and anecdotes about civilisations that have prospered around river banks and basin. Given the fact that agriculture is one of the oldest profession, water has been a defining factor for peoples' livelihoods, and their social-cultural and economic life. It is only if the communities have been resilient enough that in regions with perennial and acute water scarcity, people have been able to survive and continued to make a living from agriculture and other associated activities such as animal husbandry and horticulture.

Thar Desert

Thar Desert region that falls on the Indian side and stretched across Western Rajasthan is one such areas that witnesses recurrent droughts and acute water shortage. Spread over 342 lakh hectares of land, out of which 60 per cent constitutes of the Thar desert, Rajasthan faces acute water shortage as it suffers from the lowest amount of precipitation in the country throughout the year. It is despite this that with a density of more than 83 people per km2, it is the most compactly densely populated desert on the world and about 40% of the population of Rajasthan state in India lives in the Thar. 60% of total area of Rajasthan state and 12 of its 31 districts are covered by the Thar.

Frequency and intensity of droughts in Rajasthan is an alarming reality. Chronic aridity of the region has also rendered this area as one of the poorest areas of India. A perpetual crisis situation exists in the area due to the increased impact on both the human and livestock population which continues to put

tremendous pressure on land, surface and groundwater resources. The acute problem of water scarcity, particularly the low rate of annual rainfall and subsequent lack of crops grown in the region, have made it difficult for people to develop agricultural land and survive solely off the income it provides.

It is pertinent to note here that even the ground water situation in the Thar is alarming. Safe, drinkable ground water is become increasingly scarce. More than half of the total ground water in the desert region is brackish, highly saline and unsuitable for human consumption. Due to the loss of natural watersheds, poor mining practices and large-scale tube-well exploitation for agri-business, the water table continues to fall at an unprecedented rate.Water scarcity has taken the shape of a water emergency over the past couple of decades. There are pockets in the 12 western districts where rainfall over the last few yearshas been less than 30 mm and where near famine conditions prevail. The villagers are dependent on rainwater, which meets their needs for about 2 to 3 months only of the year. Rest of the year, they bring water from distances of between 3 and 40 kilometers. Water is collected by private water tanks or by purchasing water fromwater carriers using tanks on camel carts or tractors.With dwindling productivity owing to less rains rural poor is already under a financial crunch and that gets further aggravated with the expenses on water purchase. In the most rural areas of Western Rajasthan about INR 500 is paid for only 500 liters of water that lasts for only few days. For those who do not have facility to store water the struggle becomes even more taxing. Women and girls in the household having no facility to store water spend half of their life only on collecting water. Dependence of ground water also is neither feasible nor sustainable. Not only, ground water in most of the areas is saline and wherever its not water extracting has pushed water table even further down.

Water scarcity affects the rural poor in multiple ways. In addition to the constant threat to their food and nutrition security, maintenance of hygiene remains a challenge in the Desert that further leads to disease and poor health. For women and young girls water fetching means deprivation from social, economic and educational opportunities.

Drought mitigation, food security, nutrition and health : Interventions by GRAVIS

Jaisalmer is the largest district of Rajasthan and one of the largest in the country. The breath (East-West) of the district is 270 Kms and the length (North-South) is 186 Kms. Geographically this district is spread over in 38,401 sq. kms On the present map, district Jaisalmer is bounded on the north by Bikaner, on the west & south-west by India- Pakistan border, on the south by Barmer and Jodhpur, and on the east by Jodhpur and Bikaner Districts. Ground and soil in Jaisalmer is sandy, dry, scorched and land is largely barren, undulating with is famous sand dunes and slopes towards the Indus valley and the Runn of Kutch. With no perennial river in the district and very dry weather, even the underground water level is very low, vegetation is sparse and human as well as well animal life is always at the margins with lack of water and food.

Jaisalmer has a very dry climate with very hot summer; a cold winter and sparse rains. The climate is extremely hot during summer with maximum temperature reaching up to 49.2 degree celcious and

extremely cold during winder with minimum temp. in the range of 1 degree celcious. The variation in temperature from morning to noon and the late midnight is a sudden phenomenon. The average rainfall is only 16.4 cms as against the state average of 57.51 cms. Despite the presence of belligerent climatic conditions and the sandy soil, conditions that not very suitable for agriculture, the economy of Jaisalmer district is largely dependent on agriculture as 61.1 percent workers in the district are either cultivators or agricultural labourers. In Jaisalmer district among the workers the percentage of cultivators, agricultural labourers, workers in household industry and other workers (category of workers) are 45.9, 15.2, 2.4 and 36.6 percent, respectively[1]. There is also huge gender gap in economy and literacy that is also very significant in the district. In the Work participation rate (WPR) of Jaisalmer district has recorded 43.1 percent and gender gap in WPR is 16.0 percent points.

According to the latest census figures available, almost 87% of population in Jaisalmer is located in rural areas. Socio economic situation in these villages in not very encouraging. Many of the villages are located in very remote areas.The sex ratio of Jaisalmer district is significantly low with only 852 females for every 1000 males. It is even lower for the blocks where the villages under the project*Safe drinking water and nutrition for rural people in Thar*being implemented by GRAVIS and supported by IDRF are located. Literacy rate in Jaisalmer district is 57.2 percent which is lower than the State Average (66.1 percent) and it ranks 28th among the other districts of the state. Gender Gap of the literacy rate is 32.3 percent in

Women play a major role in water management in Thar

[1] http://www.censusindia.gov.in/2011census/dchb/0816_PART_B_DCHB_JAISALMER.pdf

the district, with male literacy rate at 72.04 percent, female literacy rate in Jaisalmer district of Rajasthan is 39.71 percent. Per capita income per year is about INR 18,242[2] that is marginally lower than the state average.

Socio economic conditions of people in Jaisalmer district is nowhere close to its image of being an international tourist destination. Rural areas that are located remotely witness multidimensional hardships. Access to basic amenities and services is a challenge for the rural community in these areas. Families staying in the far off villages do not even have access to basic health facilities and middle and higher education. Their financial condition do not allow them to incur expenses on transport for reaching out to these facilities. The priority remains water and the means to access water. All endeavours by impoverished people get negated by the disproportionate expenses on water. Education, health, nutrition, everything gets affected. Even for young girls continuing education becomes a luxury because they are most of the time busy filling pitchers for the family. Water, and its scarcity determined the way of life of people and addressing water related problems remains the key to transform their lives.

With a vision to address the water related problems of poor rural communities in the Thar, GRAVIS has been promoting and reviving traditional technology and blending it with modern techniques to provide sustainable water security in many districts of Rajasthan Thar Desert. Taking forward its vision of more than three and a half decades to ensure water and consequently food security, health and nutrition for the poor people in the Thar, GRAVIS has been implementing a project with support from IDRF in twenty villages of Sam and Jaisalmer Blocks of Jaisalmer district.While the whole world today is looking at an impending water emergency across the globe, people in the these two blocks are entangled in this situation for long now, jeopardising any efforts towards greater productivity and prosperity for them.

GRAVIS has been working in the Thar region for the past three and a half decades to ensure access to water for drinking and agriculture use. As a part of its endeavours to ensure food and water security for the impoverished communities of the Thar, GRAVIS implemented a project *Safe drinking water and nutrition for rural people in Thar* with support from International Development and Relief Foundation (IDRF), Canada.

The challenging terrain

Both Sam and Jaisalmer block located in Jaisalmer district fall under the perennially drought prone zone of the Thar Desert. Agriculture and animal husbandry that are primary vocations of people in this area are always at the mercy of rain God. Low rains affect the agriculture produce and leaves them barely enough to satiate their hunger. During the times of distress food grainsgrown are not enough even for household consumption. This situation leads to chronic hunger among people. Lack of produce to be sold

[2] Estimate of District Domestic Product of Rajasthan, 2011-12, Directorate of Economics and Statistics, Department of Planning, Jaipur, available at -http://plan.rajasthan.gov.in/content/dam/planning-portal/Directorate%20of%20Economics%20and%20Statistics/Publication/Regular%20Publications/estimates%20of%20district%20domestic%20products/estimates%20of%20district%20domestic%20products%202011_12.pdf

in the market leads to low purchasing power and deprivation from the basic amenities and dwindling finances for any household requirement.

Acute water scarcity has a direct impact on the animal produce consequently on financial status and health and nutrition of people. Poverty is also related to basic facilities for eduction and health care, that take the first toll in the process of prioritisation. There is also considerable number of population in Jaisalmer belonging to Scheduled Castes, Scheduled Tribes and Muslims who are in minority.

Severe water shortage coerces rural households to spend a considerable amount of their finances on purchase of water and this further pushes them into the neverending cycle of penury. Water is scarce not only for agriculture and for animal needs, its less even for the point of vie of human consumption and other washing and cleaning purposes. Even at the times of rain, lack of adequate water storage facilities, rural population in these areas continues to face the issues associated with water shortage.

Women in the identified areas normally spend about 3 to 4 hours only for fetching water for household purposes. This drudgery deprives them of any opportunity to engage in socialising and also limit their chances of getting involved in any income generation activity. Carrying 20-30 litres of water every day for three to four hours naturally has associated health hazards for women.

When the drinking and cooking related water needs are barely fulfilled, hygiene and health become the target for water shortage.As per the official records, in Jaisalmer Block only about 12% of the rural households have access to tap water from treated sources, only 3% of them have a covered well and about 8% have uncovered well for drinking water purposes. In the absence of any facility of structures to collect and store water, the community in these rural area can neither collect rainwater, however, meagre in quantity, nor can explore any means of storing water in case it can be made available through transportation. It is ironical that the Sam block that is also a vibrant tourist attraction for people coming from all parts of the world and is still on amongst the most backward blocks of Rajasthan with low literacy rates and income levels. Sex ratio is as low as 810 females for every 1000 males and female literacy rates are also quite low.

The interventions implemented from August 2015 till October 2017 as part of the project *Safe drinking water and nutrition for rural people in Thar*aimed at mitigating drought through empowering communities to cope with the climatic challenges in the Desert of the Thar and subsequently ensuring food and water security for them. Key objectives of the project were:

- Making water available to people and ensuring their food and nutrition security
- Improving hygiene for better health
- Mobilising and empowering communities to cope with drought

Following villages were selected for implementing a range of activities towards achieving these objectives:

Table 1 - Villages selected in Jaisalmer Block for drought mitigation and food security

Sam	Jaisalmer
Beenda	Baramsar
Goga	Tejua
Salka	Sonu
Barna	Serawa
Kumbharkotha	Kuchhadi
Kanoi	Jethwai
Jambrasar	Birma Kanod
Sipla	Parewar
Bhadasar	Kabir Basti
Nemba	Chimaram ki Dhani

All the villages identified under the project supported by IDRF are located about 50-70 kms away from district head quarters, making it difficult to reach in the absenceof any public transport facilities. This has also been one of the factors responsible for keeping people in this area excluded from any support and Majority of population in villages are Scheduled Castes, Minorities (Muslim) and other unprivileged communities and have remained excluded from the development process that has been concentrated around the district headquarters.

II - TOWARDS REJUVENATION OF CRIPPLING LIVES : HARVESTING RAINWATER

Most of the problems in the lives of people in the Thar revolve around water - its availability, sufficiency and quality. The quality of life of people in Thar can be improved by enabled access to water sources for people within vicinity.However, it is equally important that the means to provide water are ecologically safe and economically sustainable. Taking cognisance of the fact that extraction of ground water for personal use and for agriculture is neither sustainable, not safe, given its salinity, GRAVIS has focused on creating and restoring environment friendly, sustainable and low cost structures that are based on indigenous knowledge and are further augmented with the technological innovations to make them more sustainable and user friendly. During the course of the project, GRAVIS focused on *constructing* household level rainwater harvesting structures and reviving the existing community rainwater harvesting ponds.By doing so, resolving the problem of water availability for the humans and the cattle was aimed at. Rainwater harvesting tanks (taankas)were constructed at household level, and village ponds (also known as naadis) were de-silting for the common benefit of the community.

Taanka is of the most common, traditional and efficient water harvesting structure designed to collect and store annual monsoon rainwater and transported water (by camel/cattle carts, and tractor tankers) adjacent to the family house in dry areas. It is an underground tank for harvesting rainwater as well as storing water. The taanka is a cylindrical underground storage tank made primarily from local materials and cement mortar. They are 10 feet deep with a 10 feet diameter and have a catchment area of 70 feet. The roof protrudes 0.5 meters above ground and has two openings. One faces towards a large open catchment. During rainfall runoff generated by the catchment area is efficiently funnelled through a small inlet. This method for collecting water has the capacity to store between 18,000 and 20,000 litres of water. Water is gathered in a groundwater catchment area where water pours in through a grate on the side.

Collected water is easily accessed through a small metal door on the *taanka* roof using a bucket tied to a rope. This allows a family to easily fetch safe drinking water for a large part of the year. Each *taanka* has wire meshes fitted in the outlet and inlet to prevent rodents, insects and garbage from entering. Before the onset of the monsoon each year, meticulous care is taken to clean the catchment area of *taankas*. Cattle grazing or entry with shoes into the catchment area is strictly prohibited. *Taankas* are an important element of water security in the Thar Desert. Few households in the project villages had their own small *taankas* constructed from local materials, but their capacity was limited. Only the rich can afford masonry *taankas*, which are large in size. People who do not have access to their own *taankas* have to depend on others and this has been a source of exploitation.

There are a number of benefits that can be derived from *taanka*. Not only does it provide drinking water for 4-8 months in a year by harvesting rainwater, it mayalso act as storage units once the harvested rainwater has been exhausted. It is also seen that *taanka* also prevents further depletion of ground water, ensures good taste, cleanliness, and quality of water, preventing water borne diseases. It definitely savesa

lot of time and money spent on fetching water from faraway places and hence relieves women from the drudgery.

The fact that the water is available in vicinity relieves the local people from the tremendous emotional stress due to water shortage and also improves self-reliance of the rural populations and their standard of living in the areas with poor ground water resources. In addition to being sustainable it is also a cheaper alternative to piped water and definitely saves a lot of money otherwise spent on purchase of water by poor rural households. First *taanka*was built by GRAVIS in 1985. Since then, GRAVIS has built 6,635 taankas which are maintained by locals. One taanka can support a family of 10 for 4-8 months of the year.

As part of the project supported by IDRF, 65 such rainwater harvesting tanks (taankas)were constructed and since then each one has been a critical source of water for atleast two families.With even little rains, these tanks accumulate waterthat can be used even during dry spells for household purposes, cleaning and for cattle. A taanka can store approximately 20000 litres of water was stored in the tanks that has benefitted over 600 people directly and another 800 people including women and children, indirectly.

In the Thar Desert, as in the rest of the developing world provision of water for the household use is primarily a woman's responsibility, and construction of rainwater harvesting tanks has saved women from the daily drudgery. It was observed that women in the identified villages were spending 3 to 4 hours every day prior to construction of these tanks and this time is saved now. Carrying 30-40 litres of water every day for these many hours also used to take a toll on their health and that has also been prevented owing to these tanks.

There are a number of other ways too that these rainwater harvesting tanks have impacted the life of rural communities in the twenty identified villages. For instance, an average amount of Rs 2000 per month during six months of dry season and Rs 12,000 per yearwas being spent by every household to purchase water for household use. Since people are not required to make this expenditure anymore the saved amount can be used for other important expenses such as food, health care, education and transportation etc. This is gradually leading to improvement in the standard of living and a better quality of life for the people in these villages.

Time saved from drudgery has also been a resource for women in these villages. Women are able to socialise more now with fellow women and have been able to find time to explore the possibility of acquiring new skills. Many women have taken membership of various self help groups and are also being initiated into some or other kind of enterprise. There are a number of women who reported that saving of time has come as a boon for them, they are able to get sufficient time to do household work and also quality time with their families. They also said that with the saved time they are not only able to spend more time with their children and do other things, they are also able to find time to visit health facility fin case they themselves or any other member, especially a child in the family falls sick.

An intergenerational impact of this has been on the education of girl children. It was reported during the discussions with the beneficiaries that girls have been able to attend school regularly now. In some places, girls used to each reach school late or had to leave early because they had to fetch water. However, now not

Rejuvenated Kabir Basti Naadi is lifeline of villagers and cattle

only are girls being regular to school, they are also able to spend some time studying at home. Community in these villages foresee a bright future for girls' education in this area now that was getting neglecting earlier and all this is directly attributed to the construction of *taankas*.

III - WATER FOR CATTLE AND AGRICULTURE : FOOD AND FODDER SECURITY

Agriculture and animal husbandry are the two complementary occupations that are fulcrum of rural economy in the project area. While water scarcity comes to haunt any efforts towards revitalised agriculture and availability of water and fodder for the cattle, little amount of water that is deposited in the sporadically located village ponds or *naadis* in various villages come to the rescue of rural farmers. During the project efforts were also made to revive some of the community sources of water.

Naadi or village ponds are natural collections of rainwater that provide an open source of water to entire villages. Natural vegetation grows easily in these areas and helps to further reduce soil erosion and silting of the naadi. A medium sized naadi provides a community with water for 4 to 6 months in a year depending on the extent and intensity of rainfall, whereas big ones carry water all year round. These *naadis* are a crucial medium to make water available for drinking, agriculture purposes, for the cattle and play a major role in ensuring food security for people.

Care is taken to keep it clean especially before the onset of the rainy season. Nobody is allowed to defecate or contaminate that area. However, with the focus shifting towards government provided water supply that is infact happening only in urban areas the upkeep of *naadi* has suffered. A number of *naadis* have been allowed to silt up. GRAVIS has been motivating the communities to revert to traditional self-reliant methods of water harvesting and de-silt these ponds and restore them to their original capacity. De-silting leads to an increase in capacity (water stored) and also percolation. De-silting of a *naadi* typically entails removing silt from the pond bed, leading to increased storage, repair of embankment where it has been breached, plantation and earthwork in the catchment to stabilise it and reduce soil erosion, gigging of wells in the pond, if the strata is suitable, to get drinking water even in the peak summer months.

It costs about INR 200,000 in order to de-silt a medium size 3,000,000 litres*naadi*During the project supported by IDRF GRAVIS supported de-silting of two*naadis* inJaisalmer district. This de-silting exercise has resulted in improved access to water forover 6000 people in the area, making 6,000,000 liters of water available for people in the villages of Jaisalmer. Many households are using this water for horticulture, for livestock and for other personal uses.

Availability of ample amount of water for livestock has led to improved productivity and many families are able to make money by selling the milk and other milk products. Both horticulture and animal husbandry have got a boost with the de-silting of *naadis* and have direct impact on the financial status and food and nutrition security for the people in this area. Discussions with the rural community also revealed that for a number of households these *naadis* are the only source of all water related needs and they have been able to cope with the financial problems better as they do not need to spend a lot of money on water purchase.To date, GRAVIS has worked to de-silt 263 naadis, supporting 801,140 families.

Revival of these *naadis* has reinforced community's confidence in the importance of local and indigenous resources, especially water. This newly found confidence has resulted in a invigorating their enthusiasm and has encouraged them to explore other such local resources as well and revive other such water resources. During the lifetime of the project, discussions had started among the VDC members and the village leaders to identify such other water sources and make collective efforts to de-silt and revive them. Accumulation of water in *naadis* that have been de-silted and its use for the human population and cattle have become a source of inspiration for the villagers in the vicinity to carry out de-silting in their respective areas.

Table 2 - Intervetions in numbers

Interventions	Number	Men	Women	Total
Taankas	65	195	325	520
Bio Sand filters	65	195	325	520
De-silting of naadis	2	3500	6500	10000
Training of VDC	8	95	65	120
Horticultures units	35	105	175	280
Technical Training on water management	2	35	25	60
	177	4125	7415	11540

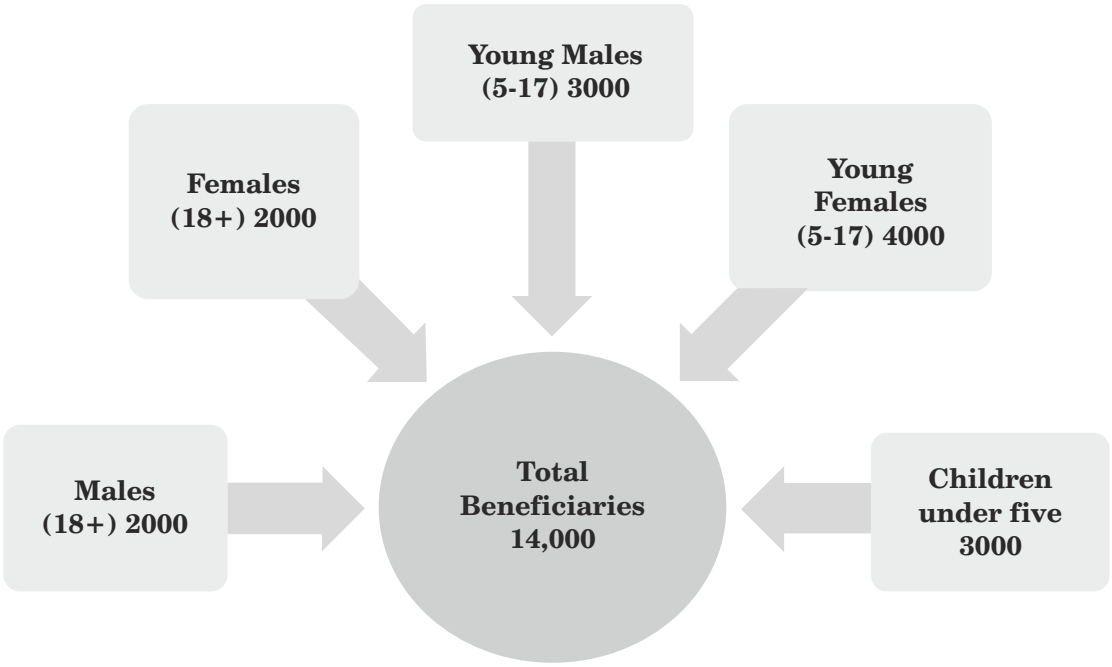


Figure 1 - Project outreach

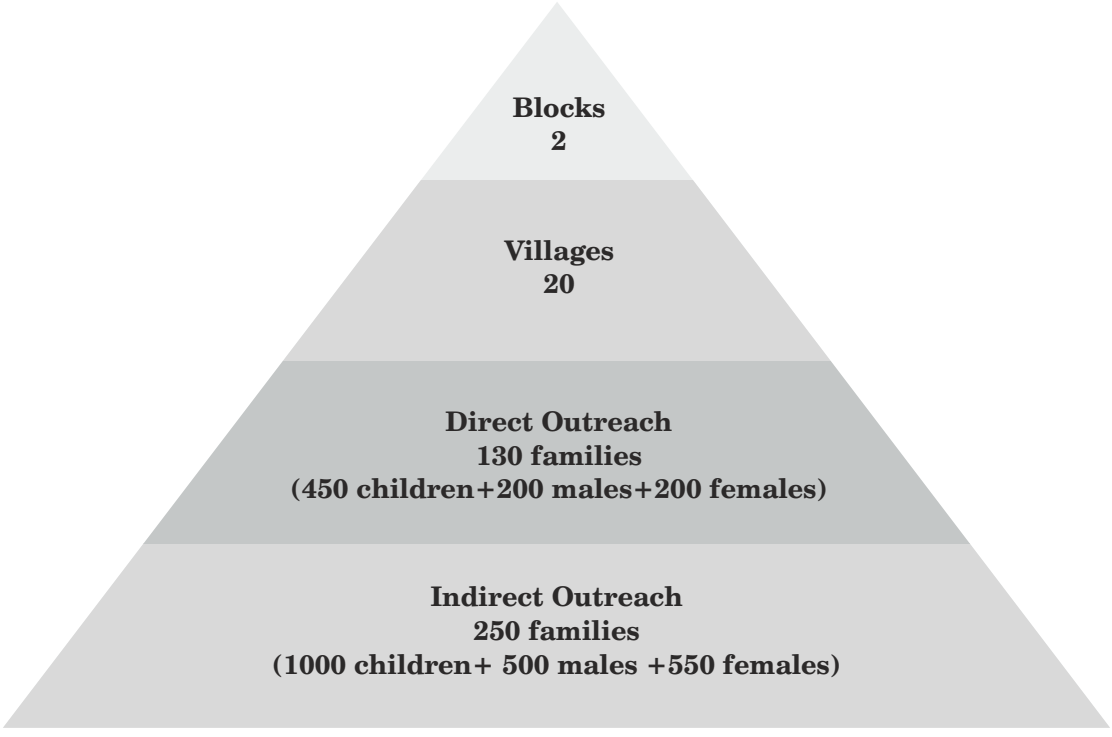


Figure 2 - Direct project outreach

IV - QUENCHING THE THIRST : MAKING SAFE DRINKING WATER AVAILABLE

Water scarcity is not the only issue that rural households in Jaisalmer are confronted with, quality of water is an equally, if not more, serious problem for them. Since water is already scarce, impoverished rural communities having no means to access clean water are forced to gulp down whatever for it is available to them – contaminated, dirty and saline.

The 69th report of National Sample Survey Office (NSSO) ranked Rajasthan among bottom five states in India for having least access to drinking water and toilets in rural areas. 1.09 crore people or more than **25,000 rural habitations in Rajasthan** drink biologically or chemically **contaminated water, says a report of the Ministry of Water Resources. This situation is much worse in the rural areas of Western Rajasthan owing to water scarcity and drought like situation most of the time. In parts of rural Rajasthan, only 39% households have drinking water facilities within premises. Nearly 32% families travel half-a-kilometre daily to fetch drinking water.**[3]

Lack of access to sufficient and safe water for drinking and other household purposes is perennial issue for the rural population in the Thar. In the want of water personal hygiene and cleaning are rendered tertiary importance and drinking needs of humans and animals, assume greater importance. With the limited water at disposal people tend to remain vulnerable to various kinds of infections and diseases. For the households that have storage facility, maintaining cleanliness and safe quality of water is a challenge. When water availability itself is an issue, access to clean and safe drinking water becomes an unaffordable luxury for people living in abject poverty.

GRAVIS introduced bio-sand filters in the identified villages in order to ensure safe drinking water and storage of the same. Bio-sand filters are locally made filters by using sand, lime stone and some time coal to purify water. This technology uses local materials to filter and clean drinking water. A concrete box of about 1 m height is filled with a layer of coarse gravel, finer gravel, and a larger layer of sand which filters the water. Above is a liquid layer containing micro-organisms which consume pathogens in the water. After the water passes through all these materials it flows out of a tube and into a sealed water storage unit.

These filters have capacity of filtering 14 litres water in 12 hours that is sufficient for drinking and cooking purposes for one household. GRAVIS with support of IDRF installed 35 filters in different houses. Through these filters the entire family is able to get clean and pure drinking water and safe water for cooking as well. The primary cause of water borne diseases and many infections is being addressed with the help of these bio-sand filters.

During the discussions with village community and village leaders it was reported that there are less number of children now who are falling sick especially in the households where biosand filters have been

[3] Drinking water, Sanitation, Hygiene and Housing Condition in India, NSSO-69th Round, December 2012, Ministry of Statistics and Programme Implementation, National Sample Survey Office, NSS Report No. 556 (69/1.2/1), http://mospi.nic.in/sites/default/files/publication_reports/nss_rep_556_14aug14.pdf

installed. This incidences of water borne infections and other common ailments among women and children have witnesses downward trend.There is also and overall improvement in the health and immunity status of people and general health profile is also gradually improving. However, most

Wife of Jamaal Khan - beneficiary of Taanka and biosand filter, Village Kanoi, Jailsalmer

Transformed lives

Family of Jamaal Khan lives for many generations in the hamlets of village Kanoi in Sam Block of Jaisalmer district. A family of seven, including three daughters and two sons, lives in a mud house and makes a living by the meagre sum that Jamaal Khan is able to earn by the daily wage. This income gets substantiated by the milk produce by few goats that he has.

Although access to water has always been an issue for the family, it came to haunt them even more belligerentlyafter Jamaal Khan's family started living separately from his parents. With absolutely no source of water nearby, Jamaal Khan's wife and his two daughters had to spend almost four hours everyday to fetch water for the family. In the absence of any storage facility she had to travel more than

once for water. Quality of water was also a great concern in the absence of adequate water facility. When Jamaal Khan could afford, he used to buy water but always had to store in his neighbour's tank. All these complexities continued till he was identified by the Village Development Committee (VDC) of Kanoi village for provision of a rainwater harvesting tank (taanka) and also bio-sand filter by GRAVIS under the project supported by IDRF.

During 2016, a taanka was constructed for Jamaal Khan's family and in the same year the family was also provided witha biosand filter. Availability of a combination of water storage and purifying facility has brought in a much needed change in life of all family members.

'Its difficult for me to pin point towards one of two benefits that our family has got from taankas and bio-sand filter. Intense labour and time of my wife and daughters gets saved because of taanka and we get enough water for ourselves and our goats. My daughters not go to school regularly since they not need to contribute to the water collection responsibilities any more. We also save the money that we used to spend on purchase of water and also do not need to depend on the neighboursfor water storage. In fact they need our support to provide them clean water to drink since we have bio-sand filter with us.

"I am very much grateful to GRAVIS for providing taankas and bio-sand filters, and I really hope that all other people in our and other nearby villages who face difficulties regarding water accessibility and storage, can also get these benefits." Says Jamaal Khan.

Picture 2 Wife of Ismail Khan

Construction of a *taankas* and provision of a bio-sand filter came as a boon for the family of Ismail Khan. He is about 60 years old and has a large family with five sons and three daughters who are married. He has five grandchildren also and owing to the large family size water consumption is also relatively higher. Because of less rains over past few years, the small piece of land that the family owns did not yield good harvest, and the family primarily depends on the daily wages that his sons earn. Ismail Khan's has about 15 sheep and goats and he earns a small amount by selling milk too. For the wedding of his children, Ismail Khan had taken hand loan from few people and the family was going through a financial crisis on a day today basis. Mounting expenses on the health care for his grand children were also a major cause of concern since they were falling sick very often because of some of other form of infections.

Ismail Khan feels that most critical contribution of the *taanka* has been saving the family from an ever looming financial crisis. *Taanka*stores about 20000 litres of water. It gets filled up during rains and we can make use of the fresh water for about 4 to 5 months. He said not only they do not need to buy water from outside even in dry season and in fact have been able to save a lot of money that was being spent on water. My sheep and goat also get sufficient water now and milk produce has also increased. Occurrence of illness has come down significantly because they now have sufficient water for maintaining hygiene, and the family has clean water to drink too.

Ismail Khan says, Although I knew the importance of *taanka* and bio-sand filters, I could never afford to construct a taanka of buy a filter. In fact with many loans getting the two end meet itself was difficult. If not for GRAVIS, we would never have been able to get clean water.

Diversity in the platter : More food and better nutrition

Dry and arid land in the Desert always poses a challenge for crop cultivation. Not only the sowing season is short, the productivity is also quite low because of less water. In this situation, most of the households have less food to eat and there is no diversity in their food too. The extreme climate of Desert perpetuates nutritional deficiency in the region. Lack of rain impacts fertility of land and because of low yield, community in this region gets into the cycle of nutritional deficiency, malnutrition, skin, and eye related problems in children, women and elders, that are all very common in Desert.Developing arid horticulture units initiated by GRAVIS in the region is a viable alternative for those families who have a small piece of land adjacent to their houses, have willingness to take care of plants and have access to water for micro-irrigation.

Horticulture Units are fruit orchard having diversified species of value added local fruit plants. The purpose of such unit is to reduce nutritional deficiency as well increase income level of target family. Typically, one unit is comprised of 20 plants of fruits and vegetables, well fenced and protected from animals. In unit, family can also grow seasonal vegetables as well crops in between plant rows. 35 such AHUs have established in Jaisalmer district as part of IDRF supported project.

These horticulture units have been source of nutritious food – fruits and vegetables - for the people. Additionally, it results in saving of amount that they might have ended up spending on these. However, most critical is the fact that in all likelihood poor people in the Deserthave to ensure two square meals and filling their bellies rather than incurring 'extra' expenses on fruits and vegetables. With their own

horticulture units, not only families have enough sources of nutritious homegrown fruits and vegetables, they are able to earn some extra income by selling excess produced in market. It is also important to note that these agro-horti units are largely managed by women and hence they exercise control over these units leading to an equitable access to its benefits within the family.

Iriya is a 35 years old woman living with her husband and children in Goga village of Jaisalmer district. The family has few goats but the produce is never sufficient for the family to even have two square meals for the family of five. Iriya's husband is a daily wage labourer and occasionally goes to cities in search of livelihood; Irya is left behind to manage livestock, look after children and the household.While she assists her husband in agriculture during rainy season, she has to take charge of

Iriya at her friends Agro-Horti Unit (AHU)

small piece of agricultural land too when he is away Most of time Iriya used to think about to getting some productive work to do that could add to the family income. While GRAVIS has been implementing the project, Iriya heard about Agro-horti Units (AHUs) from the fellow villagers and how they are benefitting from it.

Iriya says, 'She spoke to her husband about it, and along with him approached the VDC. Considering the interest and socio-economic condition of the family, the VDC decided to provide support to her for

establishing an agro-horti unit (AHU) at the small piece of land that was lying unused. Iriya participated in the training that preceded the setting up of the AHU. She was provided with fourteen fruit plants (6 desert plum, 4 gonda and 4 pomegranate) as well as the material for fencing in first year of IDRF supported project.

While talking about her horti culture units, she said, these plants are result of hard labour and the support provided to us to start the AHU. Initial trainings got be prepared and I got the skills to take care of the plants, protect them from animals and get good quantity of fruits from these plants.

We as a family have also taken care of the plants like our own family members. They are not like other forest plants. I and my family have put lot of labour. Watering them regularly and protecting them from harsh, cold and from animals by surrounding them with small bushes when they were small, have all been part of our routine."

It took about two years for plants to provide fruits of her hard work and patience. She received desert fruits in second year that she has been selling since then. It adds to the income of family and she is looking forward to pomegranate fruit to get ripen enough before she can start plucking them and selling. She says, 'like she keeps some desert plums for the family, she will keep few pomegranates too for the family and will sell the rest'.

Grown up plants in an Agro-Horti Unit

The support for establishing agro-horti units were dovetailed with the construction of *taanka* for the households. In most cases, time saved from drudgery by women is spent in maintaining and looking after these agro-horti units, saving women from additional burden.

During the project supported IDRF GRAVIS supported setting up 35 horticulture units. Support was provided in terms of providing of plants and seeds and trainings in establishing and maintaining these agro-horti units. In an arid region like Jaisalmer, provision of fruits and vegetable is luxury for many people. Through this intervention GRAVIS was able to reach out directly to about 280 people and ensuredfood security and nutrition for them apart from making it financially profitable for them.

Empowering communities to be drought resilient

Introduction of the scientific and sustainable rainwater harvesting and support in accessing and storing water for household and drinking purposes, are the major interventions that ensured food and water security for people in the project area. However, sustaining the impact of such interventions largely depends on the participation and ownership of local community, community groups andtheir ability and capacity to not only sustain these structures and facilities but also spearhead the movement towards ensuring similar facilities for their neighbouring villages.

Right from the beginning, GRAVIS has ensured community participation in conceptualising and implementing its interventions on the ground. As part of the IDRF project, like in the case of other remote villages in rural Rajasthan GRAVIS' interventions were initiated with mobilising the community and evolving community leadership in the identified villages. Four key aspects of community mobilisation and participation have been:

- *Formation of village development committees (VDCs)*
- *Orientation of VDC members on their roles and responsibilities*
- *Training of VDCs on water management*
- *Technical training for communities on water management and nutrition*

Formation of VDCs: mobilising communities and evolving community based democratic institutions is a time intensive exercise. It took multiple interactions with the community, both formal and informal, to encourage and motivate them to be part of the process of forming village development committees and electing those as members who they have faith in and those they feel can take decision for the betterment of the entire village. During the process, representation of women and all social groups was particularly ensured.

Twenty VDCs were formed in different villages of Jaisalmer at the beginning of the project and these VDCs played pivotal role in decision making regarding identification of beneficiaries under the project. Based on the criteria used by GRAVIS for identification of the most needy beneficiaries, VDCs took final decisions on it.

- those not having a water storage facility
- those living below the poverty line

- those where women travel more than 1.5 km for water
- widows and elderly having no support

Picture 4 Training of VDC members in progress

Table 3 - Number of trainings organised for VDC members and community

Trainings	Number of trainings	Number of Participants
For VDCs members	8	160
Technical Training of community on water management	**2**	60

*Capacity building of VDCs:*Newly formed VDCs require a lot of hand holding and training especially in the beginning and hence a series of meetings were organised for the members. The local Panchayat members, community and women of that villages participated in these meeting. During these meetings rules and regulations about governing of VDCs were prepared and shared with everyone. These meetings also provided an opportunity for objective and fair selection of the most needy and genuine beneficiaries. Monitoring of the interventions in the villageswerealso discussed during these meetings.

Eight capacity building programmes were organised as part of the IDRF project. Approximately 160 members belonging to VDCs in various villages that were part of the project participated in these trainings. Such capacity building and involvement of the community has enabled the local community about the importance of local resources and their optimal use that are existing in their villages.

Training of VDCs on water management

While there are a plenty of issues that rural communities in Jaisalmer deal with, access to water remains there primary concern. Considering this, focussed trainings wereorganised for the members of VDC of water management and importance and techniques of rainwater harvesting. Members were also sensitised about the importance of hygiene and clean drinking water, and the water borne diseases that may spread if the water is not clean. Trainings were also imparted in maintenanceof rainwater harvesting tanks and bio-sand filters.

As expected, the knowledge shared with VDCs reached the community through one to one interactions and model demonstrations by the VDC members. Through the trainings VDC members became active agents in the village to raiseawareness on all the issues discussed as well as the technical knowledge shared with them on the use and management of rainwater harvesting structures. Training of the VDC members served many purposes. Not only the VDC members were able to disseminate and share knowledge, community acceptance and ownership increased multifold when such knowledge was transacted through their own elected representatives.

Technical training to communities on water management, nutrition and health

As a part of the direct outreach to the people, in addition to direct support to families by provision of bio-sand filters and rainwater harvesting tanks, special training sessions were also organised on a range of issues relevant to them. Themes of these sessions revolved around nutrition, rain water harvesting and water quality, and their association between health and hygiene. On the issue of nutrition community members were told about the importance of nutrition for themselves and for the general public health situation and the association between healthy food and criticality of necessary intake of diverse food in our daily life. Sessions on health and hygiene focused more on the need and ways to keep surroundings clean to keep water borne diseases at bay.

Technical training for community on water management and nutrition

Various techniques and structures for rainwater harvesting and technical details regarding various rain water harvesting structures, their upkeep, cleaning and maintenance etc were discussed in detail during the technical trainings conducted for the community. Sessions were also organised on the need and importance of quality of water for drinking and simple, sustainable and economic methods of water purification for drinking purpose. Two such trainings were organised during the course of the project and approximately 6 people participated in these trainings.

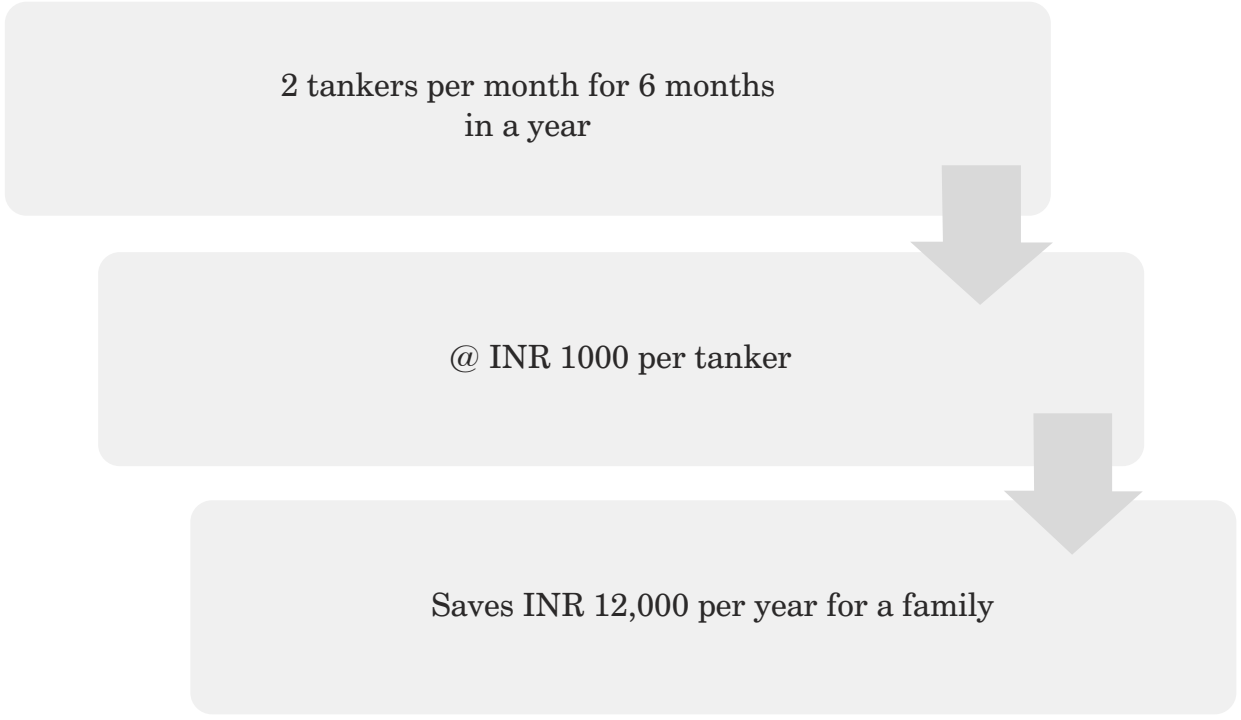
These trainings that were delivered by senior trained staff of GRAVIS helped people understand the most cost effective ways to resolve their problems relatedto scarcity of water, its management and conservation. They were also able to see their own role in the community and society as regards the larger issue of water conservation and rainwater harvesting.

Enhanced income, savings and better financial status

According to the census of India 2011 per capita per day income of Jaisalmer district is little over INR 232, about USD 4. However, the poverty in rural areas gets masked with this district level aggregated data. In the identified villages of Sam and Jaisalmer blocks people earn less than 2 USD per day. Need to spend on water on a regular basis coupled with the low agriculture and livestock productivity keeps them at the verge of financial crisis most of the time. Expenditure on and travel to access various services that are located at distance also eats up a major portion of their income.

While the primary objective of the project supported by IDRF was to mitigate drought and ensure food and nutrition security, access to water for drinking, horticulture, agriculture and for other personal uses meant enhanced income and savings. Agricultural productivity has enhanced and so the income from agriculture. Those having horticulture units are not only able to get get extra nutrition but extra incometoo by selling the produce from their units. Since water is available for the cattle, milk productivity has also increased.

In addition to enhanced income, people in Jaisalmer are also saving money spent on purchase of water and all thiscollectively is contributing towards steady improvement in the financial status of the families that have got benefitted from the project interventions.Local communities and the members of VDCs reported thatthe occurrence of infections and illnesses has been reduced over the past few months and this is largely attributable to hygienicconditions being maintained by the villagers. It was also reported that health related expenses have also come down significantly.



Money saved becasue of availability of water through taankas

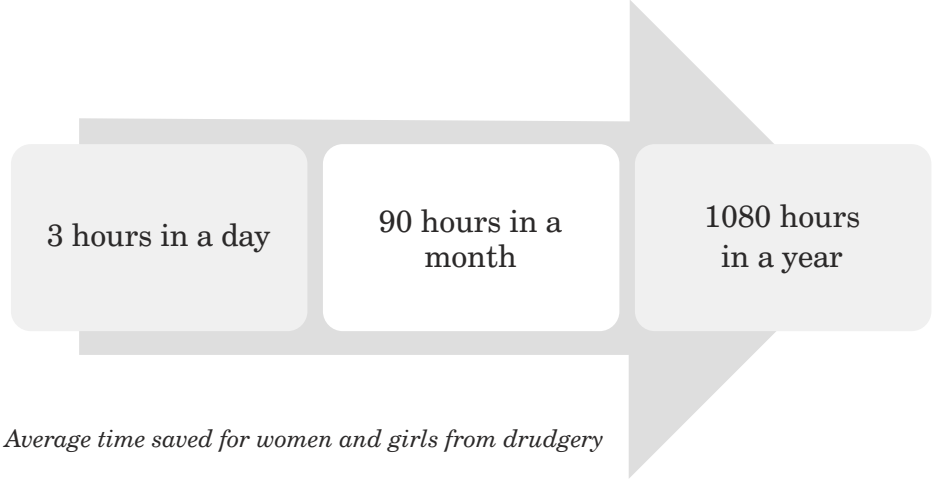
Since drinking water was always a priority, the amount of water available for maintaining personal hygiene and keep the house and neighbourhood was never sufficient. People, especially women were falling sick very often and they were left with only two options – either ignore illness or spend money on transport for visit to doctors, consultancy and medicines. This was always a burden on households having very limited means of subsistence. Situation has drastically changed after provision of water – not only health conditions have improved, there is also steady improvement in standard of living of people.

Says Shanti Devi a VDC member from village *Kuchhdi.*

Women and water

As discussed earlier, project interventions in rainwater harvesting, although have impacted everyone, have been of acatalyticimpact for the lives of women. Women are spending very less or negligible amount of time on fetching water now. They are able to use their time for other productive activities. Some are contributing more to agriculture, and some are utilising their time in agro-horti units. Many women are able to convert horticulture into a profitable endeavour that has contributed towards their financial control and increased role in decision making within household. Women's control over finances and food products also contributes towards ensuring food security and better nutrition for themselves and girls in the household.

During discussions with the women a clear trend regarding more involvement of women in various social and community activities was also noticed. Many women are forming self help groups and aim becoming financially independent and socially more active. There is a qualitative change in the self esteem of women and how they perceive themselves and their role in society. A number of women, through active participation in village development committees, have become very active in decision making at community level. The impact of rainwater harvesting has manifested in social, economic and political empowerment of women. More and more women are becoming members of village development committees, and are able to take informed and conscious decisions that can largely be attributed to the trainings organised by GRAVIS.



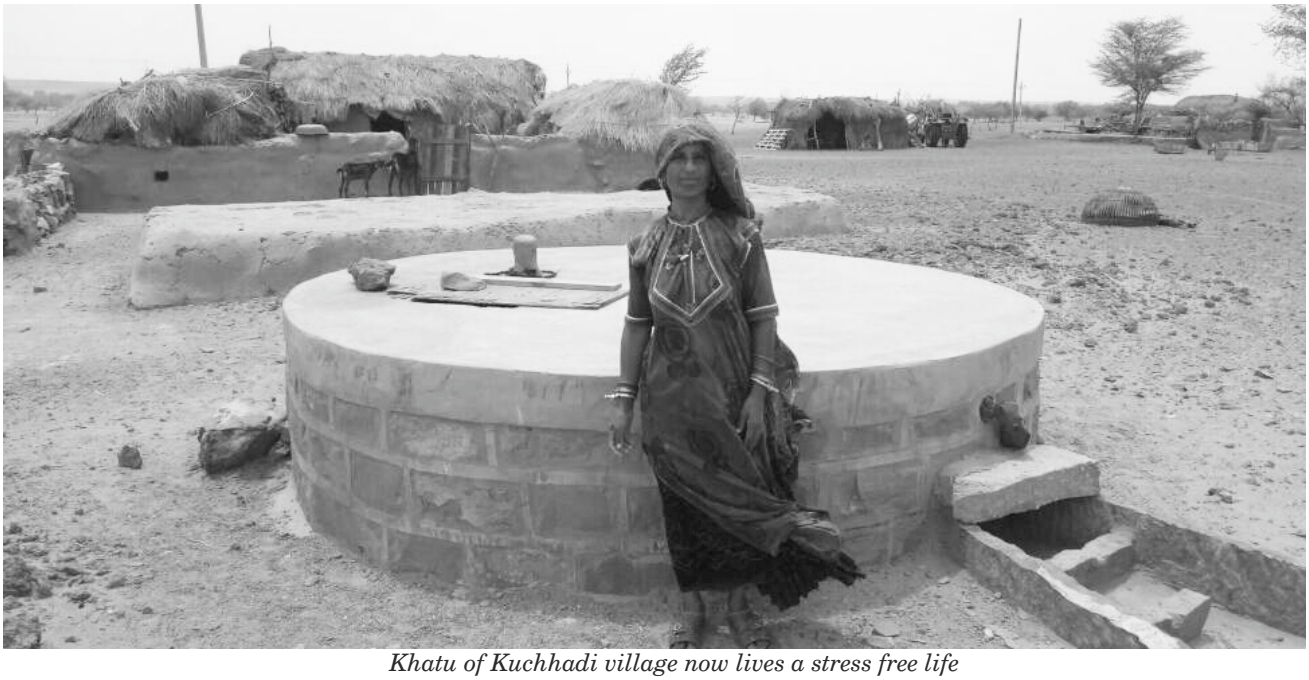
Average time saved for women and girls from drudgery

Another factor that encourages the participation of women in decision making and consequently leads the way to their empowerment and improvementin their general wellbeing, is the fact that there is also sustained improvement in the health conditions of women and young girls, after they were liberated from the water fetching duties. They also have more disposable time to themselves in case they need to visit any health facility, something that was not possible at all earlier since water had to be fetched for the household.

However, the most critical contribution of the project that is directly linked to improved status of women and especially girls, is the fact that young girls are able to attend their school regularly, they have sufficient time to study at home too and they are liberated from the daily drudgery of carrying water on their heads. Younger girls are the first generation who have got an opportunity to grow up in a milieu where their mothers are part of the social interactions and are getting empowered politically and financially. The impact of the women getting their due in the decision making role at household level, is going to have an intergenerational outcome in the form of more informed girl children and subsequently more independent and empowered female population.

A story of self-reliance and dignity

Khatu is 35 years old woman from Kuchhadi village in Jaisalmer district. She used to fetch water from a neighbor's tank since she did not have one at her own house. Most of the time, she used to face awkward situation and had to plead for water. GRAVIS supported her family with the construction of a taanka and she feels that dignity is the most crucial part of the benefits that she has got from taanka. She said that I am psychologically relaxed now, and do not need to be at the mercy of others for water since I have a taanka at my home that gets filled with rainwater



Khatu of Kuchhadi village now lives a stress free life

Treasure of rains

Devaki is a young woman of 35 years lives in Tejua village. Her village has a government water tank but it is always without water. Devaki used to travel on foot for about three kilometers twice a day to get water from other source. She used to feel exhausted and did not have energy to any She says, "I am elated to have a taanka at my house. Rainwater is sweet and not saline, we have harvested rains as gems. I am thankful to GRAVIS and others who made it possible."

Devaki of Tejua Village saves time and money

A healthy life

40 years old *Hemi Devi* lives in Tejua village. She used to fetch water from a hand pump since the village pond used to be dry almost 8 months in a year. She says, "we had no option but to drink that saline and perhaps contaminated water pumped from the ground. Because of that all in the family used to fall ill very often. After taanka was constructed at our home, we no longer are forced to drink saline water. Health of my children is improving and they are falling ill less often. Taankas has brought in a healthy life for all of us. We are free from the fear of falling sick every now and then!"

Hemi Devi and her family now lives a health life

Climate Change, water scarcity and rural context: Addressing multiple challenges

In an era where entire world is grappling with the challenges posed by the climate change, its impacts gets multiplied in Thar Desert because of the perennial water scarce situation. Impoverished communities that have already been dealing with the droughts are confronted with a peculiar situation in the wake of climate change; little rains that used to come earlier are now not coming at the same time and even if the precipitation is better, its sporadic. In the absence of irrigation facilities, the agricultural yield in the Thar has always depended entirely on seasonal rains. The difficulty with forecasting rains and changes in the rain patterns leaves the farming communities unprepared for making use of it, they do not know when to keep the fields ready to sow and when to schedule sowing.In these conditions, ability and the augmented facility to capture rains as and when it comes, help farmers to make use of the captured water as per their own schedule, without loosing out to even the additional quantum of rains that would have otherwise ran off the field.

It is also important to note that in the absence of any perennial streams, and deep wells to be economically utilised for irrigation or other purposes, artificial irrigation on any significant scale, is economically unviable and environmentally unsustainable. Since the water table is already at alarming low in the region, as against further extracting ground water, harvesting of rainwater is the most adequate alternative for the desert community. The fact that the rainwater harvesting is also economically affordable, along with being sustainable, even small farmers can make use of this technique with little support and training in maintaining these structures.

Access to clean water for drinking being made through the bio sand filter is also based on the principle of sustainability. These filters are not only economical alternatives for the electric water purifiers, but also prevent water wastage and remain most suitable for rural conditions where there is no electricity.GRAVIS has been able to provide and execute such solutions for water scarcity that are low cost, environment friendly, sustainable and most suitable for the rural conditions.Because of all these attributes, rural community can easily adapt to the use of these techniques and can be come self reliant after providing initial support and trainings. These characteristics also render project interventions the quality of being replicated in the regions with similar challenge and contexts.

Rejuvenating community life and commons

Rural poor is most of the time confronted with the livelihood and food security related challenges. With water being scarce, primary occupation is collecting water and managing and prioritising the use of it. At times, this preoccupation deprives them of the sense of community strength and resources that are available around them.The fact that people are sparsely located from each other also deprived them any opportunity to constructively interact with each other, mobilise and organise themselves to be prepared for the collective challenges.

While on one hand, the project implemented with support from IDRF has provided support to individual households, the interventions have also brought people together, mobilised them to be part of political processes. Participation in the process of formation of VDCs for instance, inculcated values of democratic participation and common good among everyone. People, especially women were able to recognise their political strength and ability to influence the community level processes and decision making.In the process of getting to know about the larger issue of climate change and sustainable ways of using water, the interventions resulted in knitting the community together, recognising their collective strength and resources. With global common depleting all over the world, experiences from the project present sustainable and pragmatic solutions that take into account global concerns while ensuring wellbeing of local population.

With this collective strength, GRAVIS has been able to take the community participation in environment conservation and developing drought resilience beyong rhetoric and has created a replicable model having potential for ensuring food security, better health and improved quality of life for people in any arid rural context living in poverty. In hindsight, IDRF supported project has also created the culture of protecting community commons for combatting poverty and harnessing social equity, which is the most critical legacy of the project.

ACRONYMS

GRAVIS	Gramin Vikas Vigyan Samiti
IDRF	International Development and Relief Foundation
INR	Indian National Rupee
NSSO	National Smaple Survey Office
SHG	Self Help Group
USD	United States Dollars
VDC	Village Development Committee
WPR	Work participation ratio

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NOTES

Gramin Vikas Vigyan Samiti (GRAVIS) or Center of People's Science for Rural Development is a non-governmental, voluntary organization that takes a Gandhian approach to rural development by working with the poor communities to enable them to help themselves. Since its inception in 1983, GRAVIS has worked with over 60,000 desert families across over 1300 villages in India reaching a population of over 1.3 million, and has established over 2,900 Community Based Organizations (CBOs). Through its dedicated field work, as well as its research and publications, GRAVIS has come to occupy a leading position amongst the voluntary organizations in India.

Gravis

3/437, 3/458, M.M. Colony, Pal Road, Jodhpur, 342008, Rajasthan, India.
Phones : 91 291 2785 317, 2785 116, Fax : 91 291 2785 116
Email : email@gravis.org.in www.gravis.org.in