

Drought, nutrition, health.



Gravis



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A study to understand the link between drought, nutrition and health.



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Foreword

Droughts have trapped communities under malnutrition and related health issues in the Thar Desert of India and other desert environments around the world. Severe food and water shortages with limited rainfall during drought spells have caused undernourishment of communities and higher prevalence rates of both communicable and non-communicable diseases. While the communities at large remain impacted by drought's health consequences, women and children are particularly vulnerable and affected.

Mitigating droughts has always been a core part of GRAVIS' work in Thar. Our interventions have addressed the serious issues of food security and water security in remote villages. Lately, we have had a keen focus on nutrition too through our interventions in the areas of safe drinking water, horticulture, nutritious crops, training and capacity building. Further, GRAVIS does have an important health focus that links our drought mitigation interventions to the well-being of communities.

A study to understand drought, malnutrition and health, and approaches to move further in this context was very much needed. This study looks at understanding those aspects and at framing recommendations for future. I thank Government of Finland and Tampere University Students Union (TAMY) for the financial support and Dr. Neetu Sharma for leading the study. GRAVIS staff and the rural communities of Thar also deserve a note of thanks for their support and participation.

Prakash Tyagi

Executive Director, GRAVIS

Author's Note

Thar, the most densely populated desert in the world and the largest in Indian subcontinent, has witnessed recurrent droughts resulting in severe hardships for the people ranging from limited access to natural resources which have had ramifications for the livelihoods, food security and general health conditions. Situation is further aggravated and is much more complex for those primarily dependent on agriculture or cattle rearing for their living.

The inextricable relationship between the climatic conditions and the general health of people is well established. Extreme climatic conditions take an irreparable toll on the general health conditions in any geographic area. Such an impact is very much evident in the areas affected by prolonged deficit of rains or the areas that are recurrently affected by droughts. Studies have shown that coupled with the hygiene related issues, drought also diminishes dietary diversity and reduces overall food consumption and absorption, and leads to micronutrient deficiencies, which invariably result in severe health issues. It is important to note that in case of women and children such a condition could lead to irreversible serious health conditions.

The need to comprehend and capture the consequences of drought and drought like situations on general health conditions of the people in Thar and ways in which drought particularly affects the health and nutritional status of women and children in the Thar desert, is attributable to the urgency to devise a combination of ways in which such situation needs to be responded to. A mapping of the existing strategies and their efficacy in responding to these issues coupled with the identification of innovations and complementariness to augment the strategies, provide some of the starting points in the pursuit to ensure food secure and healthy life for the rural poor in the Thar.

Current study is an attempt to capture the visibly discernible as well as underlying impacts of the drought on general health conditions of people in Thar with particular focus on the health and nutrition status of women and children in this region. Exploratory studies done in the past have indicated towards the inability of the community in this region to cope with the persisting health issues that emerge primarily due to the lack of water and sanitation facilities associated with the hygiene related problems as well as the declining nutritional content in the food grown and consumed in the region. The need to examine these issues is inextricably related to the urgency to relook at the strategies adopted so far to deal with the situation as well as to devise suitable approaches and mechanisms for prevention along with response strategies.

Valuable insights shared by Dr. Prakash Tyagi, Executive Director, GRAVIS, have contributed in lending lucidity to the identification of problem of food security and malnutrition in the backdrop of drought. The assistance provided by the team at GRAVIS in collecting relevant information has been very beneficial in drawing context specific inferences.

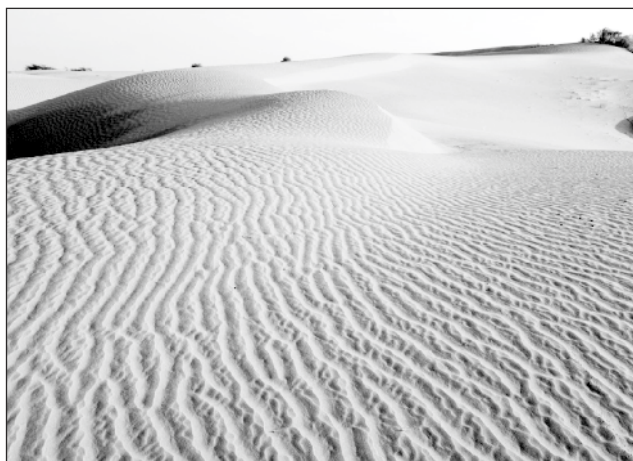
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1. Background : Thar and its health and nutrition profile

There are a range of social, economic, environment and sociological factors that determine the status and profile of community health in a given region. These primarily include level of development, awareness about health related issues, vulnerability to diseases, as well as access to treatment. However, geographical and climatic conditions in a region play a major role in the lives of the people who inhabit it. The way of life encompassing the occupations, traditions, cultural and social practices and even the economic transactions get affected by and if not exaggerated, are determined by, these completed uncontrolled phenomena, such as prevailing daily and annual temperatures, precipitations as well as surface wind. Extreme climatic conditions exert a great deal of impact on the way of living and may result in a range of complex socio economic, medical and health related complexities. In perennially drought prone areas, owing to the erratic availability, or rather non availability of water, such complexities further aggravate and could potentially cause terminal damages to health and livelihoods.

The state of Rajasthan that transcends the Thar Desert has only 1% water resource, whereas area is 10% and the population 5.1% of the entire country. 12 districts, which comprise 60% of the area of the state, fall within the Great Indian Desert or Thar which is the most populated desert in the world. 64% of its population resides in the Thar despite scanty rainfall with all its variations, timing and intensity. All these aspects have a long lasting effect on the lives of people, especially the rural poor who do not have means and resources to manage or even cope



The Thar Desert

with acute water shortage, blistering heat and sandy winds that exemplify the climatic conditions of this region. What makes the situation with regard to community health in the Thar complex is fact that most of such factors as mentioned above act negatively leading to a general health profile which is reflective of the prevalent diseases, several health related problems and an overall low level of health related indicators for the region be it nutrition, mortality or life expectancy.

1.1 Drought and Community Health in the Thar

National Family Health Survey III revealed many areas concerning health in which the state of Rajasthan is lagging far behind and the situation is worse in the rural areas where all the health related indicator point towards the poor performance of the region, the Infant Mortality Rate is 63 per 1000¹ and Maternal Mortality Ratio is 388, which are much higher than the National average. 51% of children under the age of 3 years are stunted and more than 20% are wasted as per the NFHS III. Malnutrition among women reflects a very disappointing trend with no improvement in it since NFHS II. The NFHS-3 in 2006 found that 20% of children under-3 years of age in Rajasthan were wasted, 34% were stunted and 44% were underweight. 20.4% of the children under-5 suffered from wasting and 7.3% suffered from severe acute malnutrition. This means that about

¹ State Institute of Health and Family Welfare, NFHS III – 2005 06, <http://www.sihfwrajasthan.com/ppts/full/nfhs-iii.pdf>

620,000 children in Rajasthan needed emergency treatment in 2006. 33.6 % women and 33.8 % men were found to be too thin compared to their height (BMI < 18.5).² With a maternal mortality ratio (MMR) of approximately 445 per 100,000 livebirths, the state of Rajasthan contributes significantly to India's burden of maternal deaths.³ The context of Rajasthan sets the stage for this high MMR, both in terms of its terrain and the sociocultural environment of women's lives. MMR in Rajasthan varied from 627 per 100,000 livebirths during 1982-1986 to 445 during 2001-2003. During all measurement periods, the MMR in Rajasthan has been higher than the national average. The lifetime risk of maternal deaths ranged from 1.9% to 2.2%, with maternal deaths being responsible for 29% of all deaths among women of reproductive age⁴.

These indicators are more alarming in rural areas. Adolescent girls are poorly nourished compared to boys. These circumstances of under-nutrition continue into adolescence—49% of adolescents aged 15-19 years and 37% of women aged 15-19 years have a subnormal body mass index (BMI)⁵ Adolescent under nutrition is much more common in rural (39%) than in urban areas (31%), and among women belonging to the scheduled tribes (49%) than among other castes (34%). Similarly, levels of anaemia among women in the reproductive age-group (15-49 years) are 53% among married women⁶ and 61% among pregnant women. Thus, under nutrition and anaemia among women continue as pervasive aspects of their adult lives.

According to the norms as adopted by the National Health Policy in 1982, every 3000-5000 of population there should be two Auxiliary Nurse Midwives, for every 30000 people there should be at least one doctor and one paramedical staff and; a community health centre for every 80,000 to 1,20,000. However, in the Thar this coverage has never been achieved. The table below highlights some of these gaps pertaining to the coverage.

Table 1 Population norms for primary health facilities⁷

Health facility	Staffing norms	Population coverage norms		Average radial distance (km) covered in Rajasthan	Average population coverage in Rajasthan (March 2007)
		Plains area	Hilly/ tribal area		
Subcentre	One female ANM	5,000	3,000	3.2	4,080
Primary Health Centre	One medical officer, one associated facility staff, supervisor	30,000	20,000	8.5	28,881
Community Health Centre	Obstetrician, surgeon, paediatrician, and specialist in medicine	120,000	80,000	17.8	128,465

²Acute Malnutrition, Situational Analysis in the States of Rajasthan, and Madhya Pradesh, India, ACF International, 2010, http://realmedicinefoundation.org/sites/default/files/a_report_on_acute_malnutrition_situational_analysis_in_the_states_of_rajabasthan_and_madhya_pradesh.pdf

³Registrar General of India. Sample registration system. Maternal mortality in India: 1997-2003: trends, causes and risk factors. New Delhi: Registrar General of India; 2006. p. 29 p

⁴<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2761778/>

⁵Ministry of Health and Family Welfare. 2005-2006 National Family Health Survey (NFHS 3): Fact Sheet: Rajasthan (provisional data) Mumbai: International Institute for Population Sciences; 2007.

⁶Ibid.

⁷Sharad Iyengar, Kirti Iyengar and Vikram Gupta, Maternal Health: A Case Study of Rajasthan, J Health Popul Nutr. 2009 April; 27(2): 271-292. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2761778/table/T9/>

Provision of health care, particularly at Community Health Centre is severely lacking. The availability and quality of publicly provided health care facility has in fact deteriorated since the 1990s. There have been many problems affecting the access to health care facilities by the rural community at the local level. Regional disparities, social, economic and geographic, are one such phenomenon that consistently affects such access. The difficult terrains in the rural areas of the Thar have also been a factor that has discouraged medical practitioners as well to work there.

Even though, there have been some efforts of late, the prevailing problem of healthcare service uptake pales in comparison to the huge gaps in service provision in the Thar. The region still is marred with the high levels of malnutrition and prevalence of preventable and curable diseases, high risk of communicable diseases and vulnerable food security situation which and a great proportion of such problems can be attributed to drought and water scarcity, especially in the case of rural poor..

1.2 Drought, Health and Malnutrition: the interlinked phenomena

Hardships are a corollary of drought and more often than not poor people, with access to minimal means for survival, perceive these hardships as a way of life. Despite such adjustments made at the community level by the people and an unstated acceptance of the situations, poor people in deserts get subjected to severe privations that may be perilous to their very existence itself. Drought affects the lives of people in a number of ways, however, its impact on the health of people are even more severe. Drought affects the health and medical condition of people in a direct as well indirect ways. Most of these effects are consequence of the *inadequate quantity* of water available for use at household level, while there are others that are consequence of the *inadequate quality* of water available.

Drought contributes to the problems of food and water shortages, and also aggravates several others such as energy deficiency and the nutrition status. Large scale migrations caused due to droughts also result in severe impacts on social milieu and hardships for rural population. These effects are intensified by problems of gender inequity, lack of basic infrastructure in these areas, and rapid environmental degradation, all of which have direct and indirect detrimental effects on human health. As the health of agricultural resources (crops and animals) becomes compromised, so does access to nutritious food and clean water for people, increasing their susceptibility to malnutrition and disease. Recently studies on epigenetics have shown that these detrimental health effects are not only short-term or life-long problems, but trans-generational in that they can carry over to subsequent generations.

The inadequacy of water in drought prone areas is connotative of both the quantity available at disposal as well as the quality of the available water. While it is true that water as a critical element remains absent from the discourse and concept of food security, it is in fact an integral part of the food itself. Adequate quantity of water is necessary for the proper metabolic functioning of the body, digestion of the food, excretion and even circulation of blood to various parts of the

Women & Children fetching water



body. Despite being a single largest component of the human body, there has been negligible importance attached to the need to provide water to people as part of the right to food. In places where the temperatures remain high, such as the one the Thar, water helps regulate body temperature by absorbing heat generated by your metabolism and eliminating excess heat through sweating. Although the recent policy initiatives of the government of India do talk about providing adequate amount of calories and even the micro nutrients for children, the need to provide safe drinking water has largely remained at the periphery of such discussions.

While the non-availability of safe drinking water is definitely a critical issue, other usages of water – for washing, cleaning, bathing and for cattle, and most importantly for irrigation – are equally important needs. Inadequate quantity of water affects all the aspects of human life for rural poor and water scarcity leads to several other problems such as inadequate quantity of fodder for cattle and difficulties in maintaining hygiene, which in turn leads.

There is no denying the fact that the scarcity or the erratic supply of water is a major issue, however, the problem gets further compounded by the fact that even the water which is available is also not of good quality. Biologically contaminated water with profuse amount of pollutants in it further limits the options available for potable water for the rural community. Pollutants such as bacteria, fungi and viruses that are found in the atmosphere contaminate the water due to poor handling and inadequate storage. Consumption of such contaminated water also affects the capacity of the human body to absorb micronutrients thereby leading to malnourishment, especially among children, and with extensive implications for food security and health generally for the entire community.

Also, high salinity with medically unacceptable level of fluoride content makes it difficult for the people to use it for drinking. More than half of the ground water in the Thar is brackish, highly saline and unsuitable for human consumption⁸. Due to lack of natural watersheds, poor mining practices coupled with the large scale water exploitation for agri-business, the water table continues to fall at an unprecedented rate. Most ground water being saline and sweet water found only at a very great depth, the villagers are dependent on rain water, which meets their needs on an average for three to four months. Rest of the year they bring water from distances ranging from 3 to as high as 40 kilometers. In extreme circumstances water also needs to be purchased at a high price and households have to shell out a huge percentage of their income anywhere around 20 to 50% for the same.

According to the Central Ground Water Board (CGWB) data, the concentration of total dissolved solids in the area's groundwater is 10,000 mg per litre against the maximum permissible limit of 2,000 mg/l; fluoride level is 3 mg/l against the permissible limit of 1.5 mg/l and nitrate level is 745 mg/l against the limit of 100 mg/l⁹. In the situation of water scarcity and prolonged rain deprivation, coupled with the absence of public water supply, people in the Thar are compelled to use such contaminated groundwater only. The situation gets further goaded when owing to the limitations as to the technical capabilities for converting this water into clean and safe drinking water, people in this region are left with no choice but to consume the available water only which in

⁸Sustainable water security in the Thar Desert, India: Blending traditional wisdom with modern techniques, 33rd WEDC International Conference, Accra, Ghana, 2008,

http://wedc.lboro.ac.uk/resources/conference/33/Malik_D.pdf

⁹http://cgwb.gov.in/documents/GROUND%20WATER%20LEVEL%20SCENARIO_PreMon_2013.pdf

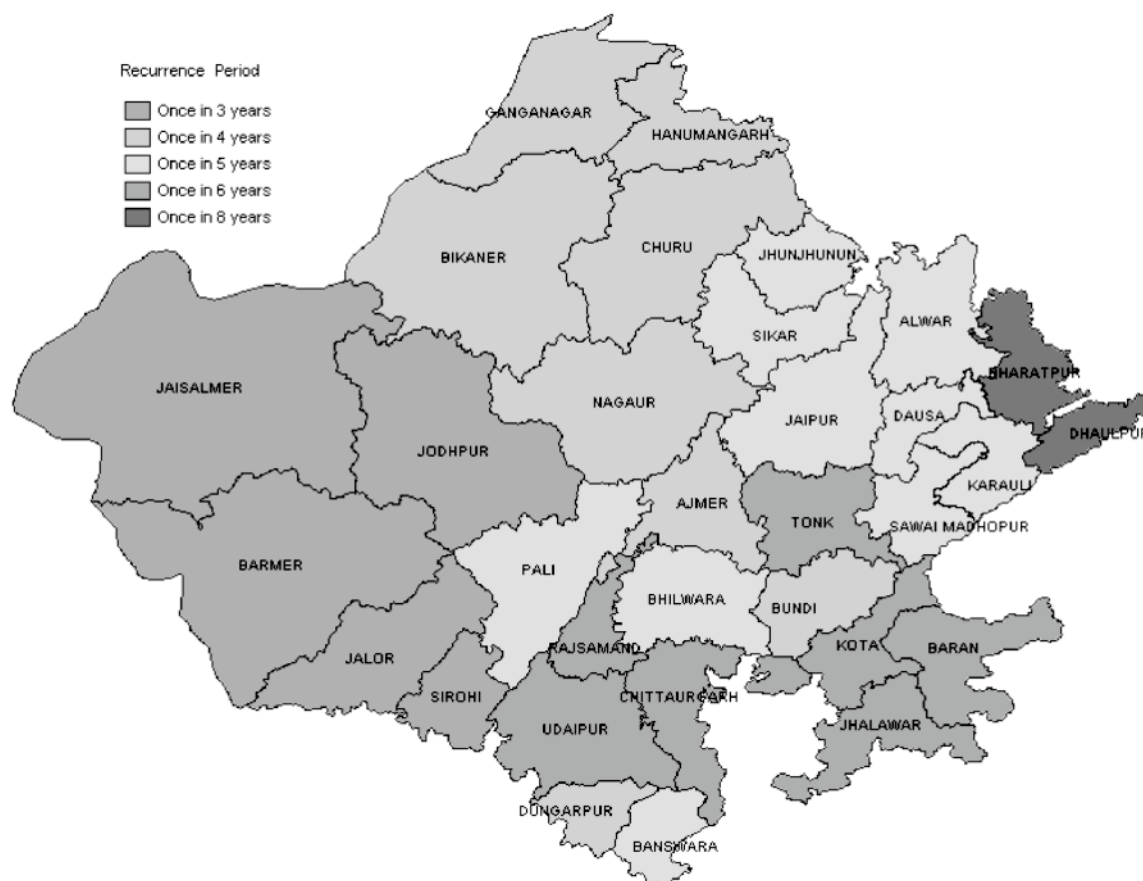
turn is detrimental for their health. Excessive content of fluoride in water may cause severe anaemia, stiff joints, painful and restricted movement, mottled teeth and even kidney failures¹⁰ Fluoride causes dental and skeletal fluorosis, osteosclerosis, thyroid, and kidney problems when its concentration exceeds 1.5 mg/L in drinking water and the intake of excessive fluoride leads to chronic bone and joint deformations in skeletal fluorosis, for which early symptoms include sporadic pain and stiffness of joints and finally the spine, major joints and muscles, damaging the nervous system. The austere impact of fluorosis is irreversible and no remedy and treatment has so far been found except prevention by keeping fluoride intake within safe limits. Both dental and skeletal fluorosis not only affects the body of a person but also renders him/her socially and culturally crippled.

1.2.1 Drought and food security

The very first and the foremost expression of the effect of drought is normally seen on the crops and the productivity of food grains. Prolonged droughts take a heavy toll on the cash crops as well as staple grains, thereby adversely affecting the general food security situation for farmers either involved in cash cropping, growing primarily food grains and even those who are doing only subsistence farming.

Frequency of Drought in Rajasthan¹¹

While frequent occurrence of drought affects a nation at a larger scale and has longer term



¹⁰ http://www.who.int/water_sanitation_health/naturalhazards/en/index2.html

¹¹ <http://www.rajrelief.nic.in/dFreqmap.htm>

ramifications for its economy and social policy, the impact of drought at village and household levels is even more intense and grueling. Drought can result in considerable intensification of household food insecurity, water related health risks and loss of livelihoods in the agricultural sector. Cyclical and recurrent droughts in almost all the districts of western Rajasthan as frequent as once every three years take a heavy and longer term toll on the food security situation.

Daunting challenges – quantity and quality

Water is a basic human need and an integral part of the human body, comportment and existence. The basic water requirements are identified as: drinking water for survival, water for human hygiene, water for sanitation services, and modest household needs for preparing food. In addition to these, the process of growing food and protection of eco systems are also contingent of availability of sufficient water. However, the life of rural poor in the Thar has been synonym to acute and perennial water shortage. Availability of water for basic requirements is scant and sporadic, and expressing itself in the most severe form when water is not available in adequate quantity for drinking and cooking as well. In these circumstances, other water needs – hygiene and etc. get compromised which consequently result in many other health related issues discussed in the subsequent section.

Table 2 Globally recommended basic water requirements for basic needs (Averages)¹²

Purpose	Recommended Minimum (liters per person per day)
Drinking water	5
Sanitation services	20
Bathing	15
Cooking and Kitchen	10
Total recommended basic water requirements	50

scenario. The huge contrast between the needs and the availability is apparent. It is important to take note of the fact that these requirements do not include the needs of growing food – agriculture and for cattle needs - which is the primary vocation of the people in the Thar.

While is the quantity of water is a major concern, the rural poor in the Thar region are also confronted with another acrimonious reality that pertains to the quality of water. Even in the regions where water is available in limited quantity, most of it is either saline water or contaminated with harmful substances. In most part of the Thar region, fluoride content of water is quite higher than the permissible limits¹³. In the absence of any facilities to purify the water coerces the poor people to consume impure and contaminated water.

Water: An integral part of food

Most importantly, water is part of the food which is to be available to everyone in all times. The very fact that water is inadequate in quantity and quality for even basic needs, deprives poor rural community of their human right to food and feed themselves. Many international instruments, most important being the General Comment 15 of the Committee on Economic Social and Cultural

¹² Peter H. Gleick and M Irwa, *Basic Water Requirements for Human activities: Meeting Basic Needs*, Water International, 21, 1996, http://www.pacinst.org/wp-content/uploads/2012/10/basic_water_requirements-1996.pdf

¹³ Radha Guatam, Nagendra Bhardwaj and Yaashoda Saini, *Study of fluoride content in groundwater of Nawa Tehsil in Nagaur, Rajasthan*, Journal of Environmental Biology, 32 (1), January 2011.

Rights (CESCR) in the context of right to water, have defined right to safe drinking water as enshrined in the provisions in International Covenant on Economic Social and Cultural Rights (ICESCR) that deal with the right to food.

Irrespective of the recognition of right to water at global and national levels, the importance of water for preparing, consuming and even digesting food can be trivialized. Water is not only a part of human body but also the major facilitator of all the functions of the body. However, the clean water is very critical for the absorption of nutrients.

The need and the importance of water as a basic human need is evident and hence its scarcity affects human body in interim during shorter spells of depression as well as with a higher magnitude and eternally if the insufficiency of water prolongs.

Impact on agriculture

Agriculture and related activities are the first to be affected by drought and considering that most of the rural households in Thar are either small and marginal farmers or pastorals, the impact of drought on the rural households and livelihoods can evidently be seen.

Impact on small and marginal farmers : Within the agricultural sector, marginal and small farmers are more vulnerable to drought because of their predominant dependence on rainfed agriculture and related activities. As a consequence, they face much greater relative loss of assets, thus widening disparities between small and large size of producers. Also, as the purchasing power declines, unemployment increases, reducing availability and higher cost of credit. Consequently, the vulnerable group is either forced to migrate, work at lower wages or live in near hunger conditions. The drought impact is also felt on village level institutions. A breakdown in the kinship and ties, patron-client relationships is common. Drought can have different impacts for various social groups and the intensity varies according to their economic strength that is the ability of households to cope with drought.

Fertility of soil : There have been evidences of fertility of soil getting affected in some of the cultivable areas. During normal rains, farmers grow varied crops during the year and this rotation helps soil retain its fertility. However during drought, it is not possible even to reap one crop. If such situation persists for a longer period of time the fertility of soil is diminished, and unavailability of water for irrigation worsens the situation for the farmers.

Effect on crop and access to food: The main crops grown in the area are millet, *mung* beans, bulgur wheat, chili and oilseed, which are also the crops that are drought resistant to an extent and can be grown in dry conditions with less water. However, in severe drought conditions yield of even these crops falls drastically. The quality of grain is also poor, for example millet plant has small sized seeds and it has low price in market. And fresh fruits and vegetables are anyways scarce in that situation. While consumption of these grains and other such produce automatically gets affected, this also adverse financial effects on who sell their produces in the market. Hence, successive years of low rainfall lead to scarcity of food and poverty.

Reduced rainfall can limit the growing season for farmers, and further reduce crop yields by creating ideal conditions for insect infestations that damage crops. This can bring increases in food prices, or shortages of certain foods, potentially leading to malnutrition.

Contamination: In a drought, farmers may also use recycled water to irrigate fields. Although the

use of recycled water is an integral part of the water management and judicious use of available water, if the process is not properly monitored, crops can become contaminated with pathogens such as salmonella. Although there are some isolated cases of such crop contamination reported, a larger scale of such impact cannot be ruled out and warrant some research to establish such link and to assess the extent of such association.

The effects of drought people's life are aggravated because of the fact that the rural economy in this region is predominantly based on agriculture and animal husbandry. Livelihood of people is dependent on monsoonal behaviour. Production of crops and fodder for animals which exceed the number of people is entirely a variable of the quantity and frequency of showers. Rains 16- 25% below normal lead to drought and scarcity.

Amongst the vulnerable populations, women especially pregnant and lactating mothers, old and infirm people, especially disabled and destitute, children especially infants and new born babies are most severely affected. Drought affects small and medium farmers and landless labourers atrociously.

Migration and debts

With deceased sources of income caused due to the loss of agriculture produce and inability to make a living for the families, people in rural areas tend to migrate to other areas either for greener pasturelands or in search of other vocations. Many families also have to rely on the loans that are though available locally, attract very high interest rates and potency to keep them under debt for longer period, especially in the times of recurring droughts.

Variety of food and nutrient

In the wake of water scarcity agriculture production goes down and even plants cannot survive for long. In such condition people have less food and fruits to eat. Primary dependence on the staple grains and a diet devoid of necessary micro nutrients – vitamins and minerals – directly affects general health and nutrition status.

Scarcity of water and balanced diets directly affect the health condition of people. With the limited source available for energy and nutrition, physical health and nutritional status of rural poor become susceptible to many deficiencies and diseases. In the times of depression, when getting staple food for the family itself is a challenge, fodder and water for cattle and their hygiene become a secondary, inevitably adversely affecting the produce of milk and thereby nutrition levels as well as the income sources of the households.



Some of the studies have shown that drought affected stock can ingest large quantities of sand and dirt which may cause impaction of the gut. Hungry stock may ingest poisonous plants or eat excessive amounts of indigestible roughage or grain. The effects of parasites and infectious diseases are often amplified in drought conditions, partly because of increased transmission in crowded conditions such as around water and feed sources, but also because of lowered immunity associated with poor nutrition. Outbreaks of diseases such as salmonellosis, fibrinous pneumonia and pinkeye can devastate drought affected stock.

1.2.2 Drought and health

With the drought gripping almost entire Thar Desert concerns are always there over the consequences of the arid climate on the country's crop yields. But droughts have far reaching effects beyond the farms, including many effects on human health and these include those which are outcome of the reduced air quality, contaminated water and inability of people to maintain hygiene. Drought also affects mental and physical health indirectly. History abounds in instances of diseases following shortage of food, which may range from slight deficiency to absolute starvation. Drought and water scarcity have instantaneous, remarkable and perpetual consequences for the public health, especially in a rural settings. The condition in Thar region is more vulnerable as compared to other drought prone area precisely because of the fact that majority of the population here is either dependent of agriculture or cattle rearing or both, and both these occupations are highly contingent on the recurrence and quantum of rainfall.

Hygiene: Water is a scarce commodity in Thar region and even the availability of drinking water also suffers a blow during acute drought situations. In a scenario where people do not have enough water to drink or cook for their meals, bathing and maintaining hygiene otherwise are not priorities. Since rural poor are unable to maintain adequate hygiene because of the limited water, it was observed that skin allergies and other skin related diseases are very common in these areas. Dryness of skin can also be attributed to the lack of fluid in the body and limited quantity of water and fluid intake. Also, in a drought, people may feel the need to reduce hand washing and other hygiene practices to conserve water. This may increase the spread of infectious diseases, such as acute respiratory and gastrointestinal illnesses. The most common mode of transmission is the facial-oral route; through which contaminated intake endure in body.

Although the traditional occupation of the rural population is agriculture, during the incessant drought many people get engaged in alternative occupation, one of them being working as daily wagers in mines. The stone dust affects the lungs and also causes tuberculosis which is a very common disease found among people who have worked in mines for a longer period of time. Silicosis is another such disease that strikes because of the inhalation of tiny crystals of silica. These lodge in the lungs and accumulate over the days, months and years of exposure. They initially cause irritation and inflammation and progresses even after the exposure stops. The condition reduces life expectancy, causing early death through respiratory failure, heart disease and secondary infections. It is pertinent to note here that there is no cure for silicosis and the damage done cannot be reversed.

While tuberculosis is curable, silicosis is not. The near fatal condition of coexistence of both tuberculosis and silicosis is difficult to manage and in cases wherever the primary breadwinner in the family himself is affected by one or the both, the entire edifice of the family just collapse beyond

repair. It is also equally important to know that availability and consumption of nutritious food is very important for the cure of tuberculosis and to prolong the life of a silicosis patient. When drought prevents supply of nutritious food, responding to the needs of such patients poses even greater challenge. Exposure to the dust particles in the atmosphere because of low moisture level, also results in the formation of stone in the liver after some time. The medical experts interviewed during the study pointed towards this.

Mental health: Those whose livelihood is directly tied to the water supply — including farmers, horticulturalists, cattle rears, may suffer adverse mental health effects during a drought. Studies have found an increased rate of suicide among people living in farming areas during droughts. Unremitting periods of drought and water scarcity affect the mental health of all the individuals across the socio economic sections of the society. Drought that affects social life and also causes financial crisis for the rural poor, have detrimental implications for their psychological status in a longer term. Financial-related stress and worry can cause depression, anxiety, and a host of other mental and behavioral disorders and abnormal health conditions.

In the Thar region, a large number of women suffer from depression and subsequently the mental disorders. Large scale migration of the males from the families to far off places for longer times and pressures of maintaining the households along with taking care of the children and older members of the family affect the mental health of rural women immensely. Not only do they suffer mentally and psychologically, social stigma is also attached to them even when they overcome those disorders. In the Thar, stigmatization of women because of their mental conditions and related social customs and rituals aggravates the situation.

1.2.3 Drought and malnutrition

The availability and absorption of the nutrients becomes a challenge during the drought for everyone which is even more problematic, especially among women, children and aged gets worst hit, given their special nutritional needs which do not get fulfilled during droughts. Scarcity of water leads to the diminishing capacity of human body to absorb necessary nutrients from food. The availability of the nutritious food anyways poses a challenge in avoiding malnutrition, this gets further compounded when the nutrient value of the available food items is also concaved.

The effect of such situation is much more austere and evident in case of expecting and lactating mothers, infants and young children given that there additional nutritional needs do not get catered to at all. In the prevailing conditions, malnutrition sets in very early in life and adversely affects the health status in later stages also.

With the availability of only limited quantity and quality of food, and the fact that females in the households get served after everyone else has eaten, the nutrition levels among girls and women always remain at the periphery and they remain vulnerable to falling prey to the severe and acute malnutrition. Nourishment levels also directly get affected by the drop in the availability of milk and other milk products, which are otherwise easily available for the households having cattle. Acute water shortage, inadequate supply of fodder and the need to prioritise need of the family members over cattle, especially in the lean period, deprive families in rural areas of the nutritious milk products and trigger the onset of deficiencies.

Deficiencies leading to malnourishment

Since most of the rural community in the Thar is engaged in subsistence agricultural and grow

most of the grains/maize including *bajra*, *jowar* and grams for domestic use. During the times of intermittent rains these families are also able to grow some vegetable for their use. Families that are into cattle rearing also have access to the dairy products such as milk, curd etc. However, if the rain has been elusive for few consecutive years, which is the case in most of the parts of this region, the food grains cannot be grown and even the grains that are stored by the households also get over. This leads to a situation where people have to buy grains from the market and they find it difficult to purchase all the grains which they usually would have been able to grow. Likewise the absence of affordability for the vegetables, grams and cereals also affects the access and the opportunity to consume these products in a negative manner.

Low consumption of fruits and vegetable, which are prime sources of micronutrients, contribute to the high level of malnutrition among the community. Although fruits like desert plum are available in the desert these are not available for consumption throughout the year. Since meat is not eaten because of the cultural reasons, unlikely to reach an optimum level of nutrition. In the order of accessibility, people survive primarily on carbohydrates and consumption of fats and proteins also become limited and most inadequate. However availability and absorption of iron and other micro nutrients remains a challenge.

Owing to the aforementioned reasons the people in Thar Desert, especially women and children do not get access to the adequate nutritious food leading to vitamins and iron deficiencies and the diseases caused due to them. Due to inadequate intake of dairy products and different types of grams, protein deficiencies are very common.

Majority of the children and women (about 80% as reported by one of the local Hospitals in the region) in this region are iron deficient and anaemic since they cannot afford green vegetables. Deficiency of Vitamin A in many children, women and older people has led to weak eyes, night blindness and colour blindness which are very common in the Thar region. A whopping 72.4% of the rural children in Rajasthan are anaemic. Deficiency of calcium was also cited as one of the primary reasons for arthritis, which is widespread among middle aged and old people in the Thar.

Livestock: Limited availability of water for cattle also affects their productivity and consequently the access to and consumption of dairy products by the rural community. Since sufficient fodder is not available during the times of distress, there have been cases of villagers selling their cattle off because they are not able to feed them, and sometimes just to supplement the family income from agriculture or any other source. Such phenomena lead to deprivation from nutritious food and subsequently malnourishment and deficiencies, especially among rural women and in children. All these factors make the people generally weak and prone to several infections.

Diseases and deficiencies in cattle, especially cows, goats and sheep, also affect the health of people in general. This is a major reason that affects the productivity and consequently health of people. Goats and sheep are also affected by drought, but relatively mildly compared to large animals. All caste, class and economic categories of household keep small animals for milk and ready cash. However, their health is affected by loss of vegetation of their choice. When rain comes, there is a change in type of vegetation for grazing and few animals cannot adjust and may even die. Such recurrent instances have direct impact on the food security and nutrition level within the households.

1.3 Drought and health and nutrition of the vulnerable groups: women, children and elderly

Access to adequate quantity and quality of food is a human right for all and any violation of this right has a longer term consequences on the mankind. However, given a number of physiological reasons as well as the socio economic and cultural milieu of the society, there are certain groups that are more susceptible to such violations and have to also bear the brunt of scarcities in a much more severe way as compared to other groups.

Although, drought does not discriminate and affects one and all, children, women, aged and certain traditional discriminated sections of the society in the Thar experience much dire consequences of the drought and water scarcity conditions. These requirements may also increase and differ in various stages of childhood. Failing to provide micro nutrients, along with the protein and calories, could cause everlasting damage to their growth. Not only they remain prevented from reaching their full potential growth, they also remain susceptible to many infectious diseases. Deficiency of Vitamin A that is common in the drought afflicted Thar region results in preventable blindness in children and severe visual impairment. Vitamin A deficiency also increases the risk of death in infants.

Malnutrition of children may start in the mother's womb. Young children and pregnant women are at higher risk of iron deficiency because of rapid growth and higher iron needs. Adolescent girls and women of childbearing age are at risk due to menstruation. Among children, iron deficiency is seen most often between six months and three years of age due to rapid growth and inadequate intake of dietary iron.

Although, they are required to take nutritious food during pregnancy, food and water scarcity at household levels makes it difficult. Inadequate diets during pregnancies result in anemia, weight loss, hypertension among expecting mothers. Adversative effects on foetus also become unavoidable which is also discernible from the high infant and child mortality and morbidity rates in drought affected areas. Also, women in most of the villages, even if they are pregnant, have no other option than to carry water from far of places for their domestic use and this may cause complications later. Another aspect to this problem is the difficulty in maintaining hygiene, especially during menstruation. Immediately after child birth women do household chores and cannot take care about their personal health. During drought children get less nutritious food and less milk that also results in malnutrition.

Girls and women are subjected to the patriarchal social norms that uphold the male members as the primary providers and breadwinners for the family and girl and women and expected to do the household work. Women and girls in a poor rural household in the Thar region end up spending about 40% of their in fetching water for the household needs. Long distances walked with water pots on their heads and waists cause perennial and severe pains and they still are bound by their responsibility of arranging water. In many of the households women also help the male members in the farms or at mines where they end up working when there are no rains to sow. Constant lifting and carrying of heavy water pots cause health problems, particularly among pregnant women. Physical exertion hence caused due to water scarcity takes a heavy toll on the general health conditions of women. This task also takes hours, depriving them of profitable working time or education.

Another dimension of a context specific problem emanates from the fact that girls are married off very young in the rural parts of Rajasthan. Social customs, norms and the predetermined gender roles prevent them from seeking their dues. In the wake of the droughts when the food and water are scarce, girls and women, especially the young brides, become the first victim of the food rationing at the household levels.

Adolescence and old age are also the time when additional nutrition needs are also to be provided for. However, owing to several reasons mentioned above for the non availability of nutritious food, and the incessant physical toil, health condition of aged women and adolescent girls always remain at peril. Preferences given to males – adults and children – in the family wherein girls and women eat last and all probability the least, is also one of the factors that contributes to the poorer health conditions of women and girls, especially during droughts.

A very serious and irreversible damage that could be caused by drought on child health is high levels of wasting and stunting among young children, which accordingly several studies conducted is disturbingly higher in drought prone areas¹⁴. Protein Energy Malnutrition (PEM), vitamin A and B complex deficiencies and anaemia, along with dietary deficits of energy and protein, cause such situation. This may be due to the harsh environmental conditions in desert areas where drought occurs quite frequently and adversely affects the economy, largely by eroding the coping capacity and economic potential of the people as a result of heavy livestock losses and reduced harvests, leading to increased poverty and poor food intake of the inhabitants.

Advancing age is accompanied by progressive physiological changes in functions of most organs. As people age, there also tends to be a concomitant increase in the presence and number of chronic conditions such as osteoporosis, diabetes and dementias among others. Loss of hearing, weak bones, weak eyes and ever deteriorating general health condition are anyways common features that define old age for elderly, lack of adequate and nutritious food in this age add to their woes during the times of drought.

They are far from any health services, market access and are almost without a formal economic system. Older people do not tend to move out and have to depend on extended family if they are still in villages. In terms of livelihoods, the small productive landholdings require lot of hardship with marginal rains and frequent crop failures. Poor households keep goats and only few can afford cows to provide them with nutrition from milk. Economic reforms, global warming, increasing migration, changing livelihood and agriculture pattern are also adversely affecting their lives. Regular analysis by GRAVIS has shown that most of the older people in these rural areas are moderate chronic food insecure. Life is anyways harsh in the desert and for older people situation becomes severely chronic food insecure with seasonal variations and recurrent droughts. Few other issues that contribute to the food insecurity and subsequently the health of older people include: lack of suitable livelihood options, plummeting support from the younger in the family, minimal physical assets like drought resistant cattle – camels etc, paltry incomes considering the food and nonfood requirements, scarce potable water availability and lack of physical access, and

¹⁴Singh MB, Lakshminarayana J, Fotedar R, Anand PK., Childhood illnesses and malnutrition in under five children in drought affected desert area of western Rajasthan, India, The Journal of Communicable Diseases, 2006 Mar;38(1):88-96., <http://www.ncbi.nlm.nih.gov/pubmed/17370694>.

limited efforts on the part of government to reach out to the older people to ensure social protection and healthcare delivery for them.

Dearth of any systematic studies in epidemiology focusing on the geriatric health and appalling state of research facilities available in this discipline is an expression of the indifference of the various quarters towards this age group. The fact that poor belong to disadvantaged castes also further compromises the quality of life in old age. Any element that could enable attaching importance to the availability of nutritious food during menopause which is high on calcium and iron and that could increase the capacity of body to absorb such nutrients, has been abysmally omitted from any discourse on community health, food security and needs of women.

Caste dynamics: The marginalised sections of society suffer the nature's wrath also the most and in multiple ways. Poverty anyways is a factor that acts as a hindrance to survival for rural community, this situation is further compounded for the communities that happened to be at the last rung of the social pyramid. The problems emanating from acute water shortage are much more perplexed for some castes who are discriminated against in accessing whatever quantity of water is available. The magnitude of all the problems faced by rest of the community is much advanced for such communities.

Water is a fundamental need of human body and any abruption in fulfilling this need has its calamitous consequences. As an integral part of the food, its availability in adequate quantity and quality is crucial to maintain appropriate nutrition levels and also to avoid any prospective contaminations and infections. Maintaining hygiene is directly associated with the availability of water and its scarcity can potentially destroy the livestock as well as agriculture which have grave consequences for human life especially in the rural community which is largely dependent on agricultural and animal products. Such penetrating and intense consequence of the drought entail a comprehensive strategy to not only prepare for drought and water scarcity but also build the resistant communities and systems to respond to such situations.

2. Community health agenda for drought prone Thar: Strategies adopted so far

Considering the various ways in which drought affects the human life of rural poor, the community as well as other stakeholders have also evolved a combination of strategies, either to prepare or to respond to deal with the drought. These strategies range from preparedness to save the crops from the severe summer wrath, optimizing the use of available water, preplanning in the rainy season or in the time of sufficient water for situations of water scarcity, and getting equipped with the capacities and knowledge to combat it effectively.

While there are efforts being made at the community level, by the government, the role of organisations such as GRAVIS is critical in not only augmenting such efforts but also in innovating such strategies and leveraging them for sustainable impact. The overall strategy and approach of GRAVIS has been evolved keeping in view the community aspirations, regional and local context and is based on rights based thinking that also gets fertilized by the cognizance of the need to intervene and contribute in a holistic way. GRAVIS has been working towards translating these philosophical underpinnings into pragmatic realities. Recognition to community based practices, building capacities of individuals and groups towards empowering them while also focusing on a range of issues that the rural poor in the Thar region are confronted with on a day to day basis, is in a way expression and reflection of such broad based and bottom up approach.

This broad-based approach has also naturally resulted in a range of interventions by GRAVIS towards combatting drought and minimizing its effect on food security, health and nutritional level of people, especially the women and the children. These interventions have been in the form of direct support to households as well as introducing sustainable alternatives for livelihoods and water conservation. Specific emphasis on health related issues of women, children and aged people has got deciphered into periodic health camps, medical support, and awareness generation on preventable diseases, among others.

2.1 Ensuring food security during distress

Livelihood of rural poor in the Thar is primarily dependent on their crop yields, which unfortunately intern gets determined by erratic and inadequate rain patterns in the region. Primary intervention of GRAVIS to protect the crops from droughts and water shortage have been in the area of supporting the community in erecting physical structures that ensure most optimum use of rain water and circumventing wastage of water in agriculture process.



Khadin

GRAVIS has been providing support to the small and marginal farmers in erecting *khadins* in their respective farms. A *khadin*, is an ingenious construction designed to harvest surface runoff water for agriculture. It is based on the principle of harvesting rainwater on farmland and subsequent

use of this water-saturated land for crop production. Its main feature is a very long (100-300 m) earthen embankment built across the lower hill slopes lying below gravelly uplands. Sluices and spillways allow excess water to drain off. A traditional successful water harvesting system in India Khadin is an ancient skilful and sound scientific example of rainwater harvesting system in Western Rajasthan/ India. In the Khadin area, the collect runoff percolates into the ground with time recharges the subsoil. Of the total runoff collected only 50-60% of the water is utilised. The remainder is lost to evaporation, or percolates into the underground, recharging an aquifer.

Depending upon the amount of rainfall and consequent runoff received during the monsoon, one or two crops are grown. There is 3-4 fold increase in agriculture production, in comparison with non-Khadin conditions depending upon rainfall quantity and distribution. This system assures the farmers of at least one crop even in very dry tracts. Other than improving socio-economic conditions of desert dwellers, *Khadins* also have created positive impact on the ecology of the region, effectively checking soil erosion and increasing vegetation cover. Increased yield for the rural agrarian community results ensures food security for people and also increased moisture in the soil in longer term.

Saving water for household use: While protection of crops from the harsh drought conditions has been a priority for GRAVIS, ensuring water security at household level has also been on its agenda. In rural areas of Thar, families have been devising various strategies for accumulating water for the household level needs. These included tanka, naadis, beris and other such water conservation and storage facilities. Tanka is a traditional rainwater harvesting technique, common to the Thar Desert region. It is meant to provide drinking water for a single or a small group of families and is an important element of water security in this arid region. A Taanka is a cylindrical underground rainwater storage cistern usually 10' x 10' in size, wherein rainwater from rooftops, a courtyard or natural or artificially prepared flows into the paved underground pit, through filtered inlets made on the external wall of the structure, where it is stored and can be used by one family during the dry season. Once fully filled, the water is sufficient for a family of 5-6 members for a period of 5-6 months, and saves it from everyday toil for water-fetching.

Similarly, *naadi* or dugout village pond is also an oldest and still prevalent rainwater harvesting and water storage structure. It also doubles up as source to groundwater recharge through seepage and deep percolation. The stored water in naadi is generally used for drinking by people and livestock. The site was selected by the villagers based on an available natural catchments and its water yield potential. Water availability from naadi



Women with Taanka

would range from two months to a year after the rains. Many villages were originally established

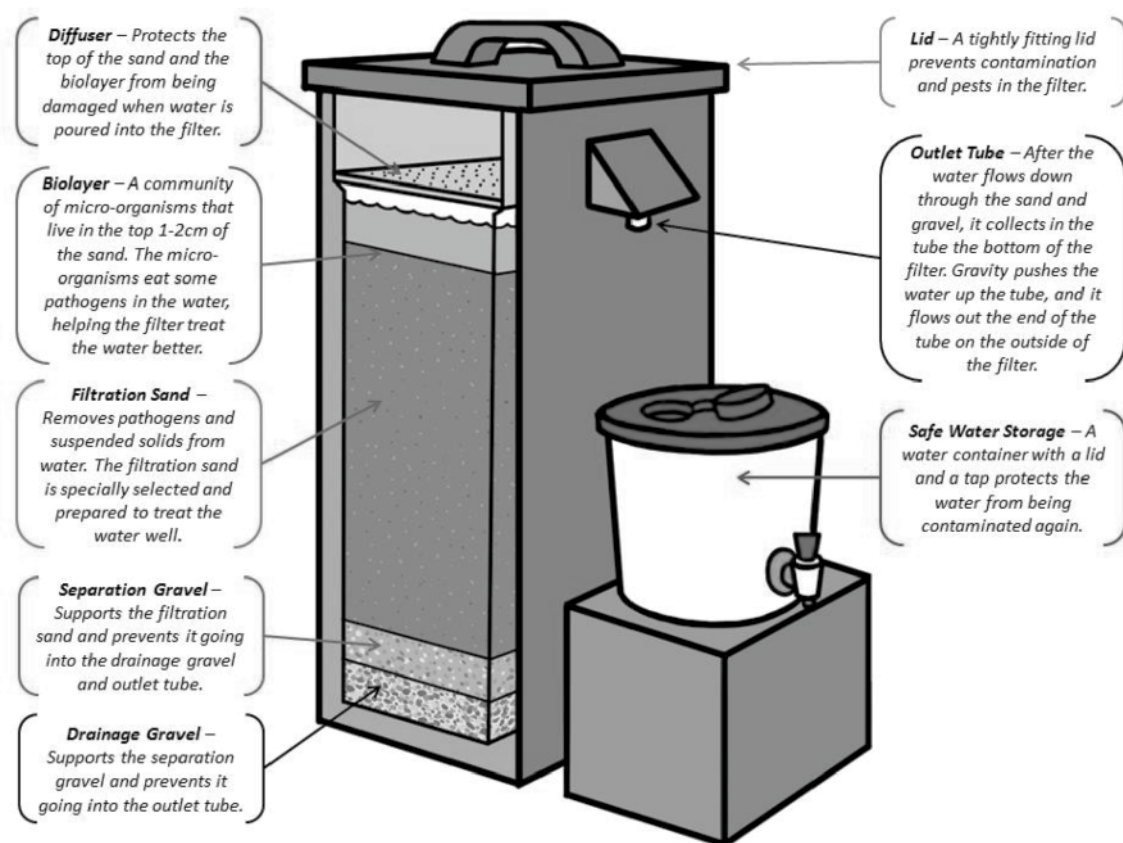
near areas that could easily be made into a naadi, which would often serve as the only source of drinking water. This entire process, ensures availability of water and less dependency on external sources. Generation of employment for people is an added advantage that contributes towards income generation, thereby food security for the households. Likewise, *Beris* are community/family wells found mainly in the drier regions of Rajasthan and are used mainly for drinking water.

Biosand filters: A relatively novel addition to the innovative interventions of GRAVIS is installation of biosand filters at households. Biosand filters are adaptation of the traditional slow sand filter, which has been used for community drinking water treatment for 200 years. The biosand filter is smaller (about 1 m tall, 0.3 m wide on each side) and adapted so that it does not flow continuously, making it suitable for use in people's homes. The filter container can be made of concrete or plastic. It is filled with layers of specially selected and prepared sand and gravel. The sand removes pathogens and suspended solids¹⁵ from contaminated drinking water. A biological community of bacteria and other micro-organisms grows in the top 2 cm of sand. This is called the biolayer. The micro-organisms in the biolayer eat many of the pathogens¹⁶ in the water, improving the water treatment. However, the most distinct feature is that it provides a pragmatic solution to the problem of inadequate quality of water, rather than focusing on the quantity.

There are a number of ways GRAVIS has been helping the community in making efficient use of these various techniques of water conservation and optimum utilization. In addition to the actual support in installing such structures that have helped the community conserve water, building the capacities in erecting and maintaining these structures as well as generating awareness among them about their use towards production upsurge in agriculture, have also been sustainable responses to many of the effects of drought.

¹⁵ Suspended Solids – dirt and other small pieces in the water (may also be called “turbidity”)

¹⁶ Pathogens are micro-organisms in water that make us sick



A biosand filter at work¹⁷

Through supporting the construction of structures such as Tanka, biosand filters and as well as building the capacities of the community in using them effectively, GRAVIS has been able to contribute to a large extent towards building household level water self sufficiency that has also helped the families to be food secure, maintain hygiene and good health. Availability of water has also helped in maintaining cattle and consequently the availability of milk for domestic use and for sale in case of those who have larger ruminants. While milk and milk produce has contributed towards improving general nutrition level, the financial gains associated with the sale of these products have substantiated the families' incomes and enabled them to purchase food items as required.

Optimum use of water to its fullest potential and also ensuring the maximum yield are basic premises for the drought resistant agricultural strategy. GRAVIS has been generating awareness among farmers to only use the available water judiciously and optimizing the maximum yields, but has also been popularizing the knowledge available in the area of agricultural sciences. Improving agricultural productivity in terms of quantity and quality (e.g., selection of drought-resistant crops and animals, yield-sensing technologies, simulation models of crop growth, etc. are some of the areas in which the available knowledge has been shared with the farmers, they have been persuaded to adopt those practices and they have been supported in it through monetary or technical training support, or both.

¹⁷ Image courtesy: <http://www.cawst.org/en/resources/biosand-filter>

Other traditional practices for ensuring food security

The rural community that has been bearing the brunt of drought for centuries has themselves devised some indigenous water saving techniques and has been using them especially during droughts. Most of the rural folk, in order to ensure the availability of vegetables during prolonged water scarce seasons, dry the vegetables that are in abundance and store them to be used for their domestic use during dry seasons. Such innovative measures must be encouraged and supported since they provide sustainable and local solutions to the problems related to deficiencies of energy and micro nutrients.

Horticulture units

Recognizing the need to fill the food deficit at the household level, especially that of the fruits and vegetables, GRAVIS initiated supporting the horticultural units for families by imparting requisite knowledge and expertise as well as seeds and saplings. These units that are normally adjacent to the houses enable the astute use of available water for growing drought resistant fruits and vegetables. Given the focus is primarily on high and quick yielding varieties, several nutritional needs of the family are met through these units in a relatively shorter term as compared to the crops. Typical fruits grown are pomegranate, desert plum, lemon and gum and vegetables that are grown include various kinds of bottle gourd, etc. These fruits and vegetables provide both energy and nutrition for the family members.

Leveraging from the state sponsored programmes

The drought prone climate of the state of Rajasthan has been recognised by various governments in the state as well as by the central government of India. Several of the government initiatives have either directly or indirectly contributed towards ensuring food security and adequate nutrition for the people in this region. There have been some other initiatives also that have been specially devised to respond to health, food security and nutritional related challenges of people.

Programmatic interventions to ensure food and nutrition security for women and children: Mid day Meal Scheme (MDMS), Integrated Child Development Scheme (ICDS) and some other programmes of the central government which include National Programme for Nutritional Support to Adolescent Girls and the National maternity Benefit Schemes, have been providing support to the efforts being made to ensure food and nutrition security for school going children, children between the age groups of 0-6, pregnant women and the adolescent girls, respectively. In addition to that several programmes of state government of Rajasthan focus on poverty alleviation, drought mitigation and employment generation, have also been complementing such efforts.

Role of TPDS and MGNREGA in ensuring food security: Public distribution system and NREGA are very crucial component of the strategy to ensure food security for people, especially during droughts. Regular supply of atleast the staple food through PDS and the employment available under MGNREGA, do contribute, although in a limited way towards food security of people.

Provision of water: Government of Rajasthan also provides water for household use, primarily drinking and cooking, through water tanks to the villages. It is a great bliss for the people in desert but for the fact that many a times this water does not reach the remote villages, either get consumed or people entrusted with this responsibility are lax in discharging their duty.

2.2 Health and Nutrition during droughts

Facilitation of the implementation of water conservation techniques at the household level and in community does impart necessary vigour to the drought preparedness. However, the need to deal with the health related effects of the drought require focused efforts to be made in this direction. GRAVIS has been providing its support for ensuring better health and nutrition for people, especially for women and children. Such interventions range from building awareness among the community towards their health needs, creating a cadre of trained professionals who could respond to health needs of the poor, providing services, especially through organising medical camps, and building financial capacities of the community to deal with the health emergencies caused due to severe water scarcity.

Medical and health awareness camps: Intense heat, long working hours in the field along with the lack of nutritious food leave many people malnourished and weak. Direct medical help is extended by GRAVIS through organising health camps that are aimed at screening the general health of people and suggesting remedies, facilitating treatments and giving referrals for further treatments. Such kind of support provided to poor rural community helps keeping complicated diseases at bay and dealing with the small illnesses at their preliminary stages only.

Generating awareness on the issues concerning health is a major requirement in a largely uneducated communities in the Thar. Recognising this need, GRAVIS has been organising several health awareness camps and making sustainable contribution to improving health condition in the Thar region. While importance of maintaining hygiene, need for regular health checkups and importance of nutritious and balanced diets especially for women and children, have been constant features of curricula for these camps, family planning, information sharing on HIV/AIDS, other diseases and their prevention, demerits of child marriages or early marriages have also been discussed with the community during these camps.

Health awareness among women is very low in the Thar region. Lack of nutritional foods and unhygienic condition make them vulnerable and they suffer from Anemia and malnutrition and other illnesses resulting from them. With a view to respond to the health needs of women and children, GRAVIS has also been organising special medical camps for women and children. These medical camps have provided opportunities for pre and post pregnancy health check ups for women, health check ups for children, information sharing during pregnancies, guiding women on the need for proper, balanced and nutritious Diet, emphasising the need for vaccination for children between 0-5 years old, and also information sharing on seasonal diseases and precautions to be taken.

Reaching out to adolescents: Adolescent health has always been a matter least discussed in public fora. Despite the immense need to respond to the adolescent health related issues, the information available in this regard has rarely reached young boys and girls owing to several social and cultural reasons. The fact that the health education and guidance to the children in the villages is not considered at all important, makes it even worse with the young girls and boys to be left to learn on their own their physical and psychological challenges. Taking note of this situation GRAVIS has taken initiative to reach out to adolescents through a number of camps and has educated a large number of them on their physical and mental growth related issues. Major issues discussed during these interactions included: puberty, common health problems during adolescence, preventive health care, precautions and responding to reproductive tract infections,

sexually transmitted diseases including HIV/AIDS, environmental health issues in the Thar Desert and social evils and domestic violence.

Such workshops also provided opportunities and platform for cross sharing and learning on the various ways and means to deal with the drought related problems and complement the efforts made at different levels. Such interactions at state level and also served as platform to consolidate advocacy efforts at state level and build a network of individual and organisations that could negotiate effectively with the state government for revising the health care facilities and primary health care level.

Building financial capacities to deal with Health exigencies:

In spite of all the arrangements made to prevent health hazards, the implication of drought on the health situation in most of the cases cannot be evaded. Responding to such situations require the community to have a sufficient financial resources that further burden their economic situation. Exploring the community level situation for responding to such need has been successfully experimented and experimented through the creation of village health funds (VHF). VHFs are the pools of financial resources that are created with the contribution of the villagers and are used during the financial emergencies by the community according to the norms and rules as decided and adopted by the community. GRAVIS has provided support in creating and maintaining the VHFs and also equipped the community in maintaining these VHFs based on their own needs, requirements and preferences. Such VHFs have been extremely useful in supporting the community deal with the health related financial expenses in the times of water scarcities and prolonged droughts, especially when the other sources of income and anyways skewed.

Capacity building of health workers and civil society organisations

Support provided from GRAVIS can be sustained only if the community has the necessary capacities to continue with such interventions and the other civil society organisations, as well as the government machinery is able to respond to the needs as and when required. GRAVIS has been investing in building the capacities of the community, other CSOs and the government functionaries working in the health care system at village level.

Health workers play a very important part in responding to the health needs of people at the village level and act as a bridge between villagers and the health facilities. Given that there have been absolutely inadequate provision for training of these workers, GRAVIS has been providing such training to the health care staff, especially concerning issues of that crop up during the outbreak of seasonal diseases, precautions to be taken during pregnancies, and importance of hygiene, vaccinations and consuming nutritious food for good health. Further emphasis has also been placed on the capacity building through facilitating exposure for them to the hospital setups and the various work cultures pertaining to the health care delivery.

While immediate response to the health related issues emanating from drought and water scarcity is important, these can be augmented and qualitatively increased by the building the capacities of the functionaries of civil society organisations. GRAVIS has been organising capacity building programmes for those involved in service delivery and advocacy on the health related issues and also the strategies to deal with drought. Workshops at block, district and state level have been organised by GRAVIS towards equipping the functionaries in working with the communities towards ensuring droughts resistance and coping.

3. A comprehensive and coordinated approach towards responding to health and nutritional challenges in the Thar

Among the rural agrarian community of the Thar, the effect of drought and water scarcity on the agriculture and cattle, that are their productive resources to access food security and nutrition, is understandably of utmost concern. In case of crisis people need immediate relief like water supply, food for work activities while in some area we work for drought preparedness like construction of *taanka*, *khadin* etc. so that people could catch rainwater in structures. In all cases capacity building is must therefore we organize various training sessions of water management, health and hygiene and also on nutrition. The best way for combating problems is to capacitate people so that they could utilize their existing recourses in a better way.

3.1 Ensuring food security during distress

Since the food is primarily sourced by the rural community through the agriculture and related activities, saving the crops and agriculture from the wrath of drought and ensuring good harvest for the farmers must be the priority.

Adapting suitable agriculture practices: Major interventions that are being put to use and that are to be further explored and expanded to save crops include the following: *Water and soil conservation* through agronomic and engineering measures need to be integrated. Other measures of water conservation like contour cultivation, different kinds of bunding, bench terracing in conjunction with cover cropping and appropriate land-use practices enhance water conservation and productivity and also recharge the aquifer over a long period. They have to receive more focus in an integrated fashion. Further, *Land-use systems* should match water availability. Therefore, there is a need for the continuous education of farmers in order to adopt water efficient practices, low water requiring crops, conservation irrigation and deficit irrigation, to economize and save more water. Such capacity building and awareness generation is needed in the area water conservation, drought resistant cropping patterns and agricultural practices, health and nutrition awareness as well as maintaining hygiene, etc.

Livestock Management: Almost all people in the rural parts of the Thar have cattle either with smaller or big ruminants. During drought with less amount of fodder for many people sell their cattle owing to the inability to feed them. Since a large number of rural community of the region depend on their livestock for their living, it is pertinent that the arrangements for ensuring the adequate supply of fodder to cattle and preventing the occurrences of diseases among the cattle herd is critical to ensuring food security and nutrition. The provision of enough fodder can be ensured by fodder stocks maintained at the local level. Such fodder buffers should be distributed among the cattle bearers during the droughts. This will prevent diseases among cattle, ensure adequate nutrition for the community, and would also prevent large scale migration that happens in the lack of availability of fodder and green pasture lands.

Community wisdom: In addition to the newer avenues of research it is also equally important to document traditional practices in a cohesive manner and disseminate this collective wisdom across the region and other areas that have to bear the wrath of drought intermittently. Age old practices adopted for water conservation at the household and community level have supported a great deal towards building the capacity of people to deal with the drought. Be it the community pooling of resources for the dry days or inclusion of certain quality of food to escape

malnourishment. All such practices are either getting extinct or are not being optimized to their fullest potential. Capturing and disseminating these practices and reaching out to the people who could make use of them has been completely lacking from the drought combatting strategies. Although some organizations like GRAVIS have been making efforts in this direction, these efforts deserve further invigoration and more investments on part of the government and non-governmental agencies.

Alternative Livelihoods: During the time of drought, agriculture gets affected to a great extent and small and marginal farmers are left with no option for their livelihoods. Although many of them work in stone mines on daily wages, a significant number of them migrate to the far off places in search of employment. In order to minimize the impact of drought on the lives of people provision for alternative employment and livelihood option critical. Such efforts can be made by forming self help groups and cooperatives. There are few such self help groups that are already operational in the region with the technical support from the civil society organizations and government in some cases, however these efforts are required to be invigorated and intensified in order to ensure sufficient alternative livelihood for the rural community.

The optimism and the enthusiasm attached to the Mahatma Gandhi Rural employment Guarantee Act (MGNREGA) has fizzled out, courtesy many operational problems and malpractices. Even where it is being implemented, the fact that it offers only 100 days of employment fails to check the large scale migration which is a very significant consequence of drought. In addition to ensuring that the not only MGNREGA is implemented and people do get employment, alternative means for livelihood also are needed to be explored.

Ensuring access to water resources for household use: Drought is a slow-rise event that can affect any area of the country at any time. Unlike some natural disasters that occur unexpectedly and necessitate intense public health response activities (like earthquakes and tornadoes), drought is a condition that can be anticipated well before it becomes a threat to the health of a community. Also, it is an external factor which is beyond human control and preparedness is the only way to mitigate drought so that its effect on livelihood, health and nutrition could be minimized. Preparing for drought may be seen as a multidimensional approach that encompasses, conserving water in a systemic and organised manner, building the resilience of the community in terms of their food security, health and nutrition related needs, as well as remodeling and modernizing the early warning systems using latest information and technology.

Community Preparedness for drought in Thar: Drought planning process which has three components: monitoring and early warning; risk assessment; and mitigation and response, can be followed in the development of a drought preparedness plan. The monitoring and early warning component of a drought plan is essentially provides the foundation on which timely decision can be made by decision makers at all levels (i.e., farmers to national policy makers). Given drought's slow onset or creeping characteristics, monitoring all components of the hydrological system is the only mechanism for detecting drought's early onset and its potential impacts on sectors, regions and populations groups. This information serves as the basis for management decision during both the developing and receding phases of drought, including the timing for the start-up and shut-down of mitigation and emergency response programs that are part of the drought preparedness plan.

Reducing the risks and therefore the impacts associated with drought in the future requires that much greater emphasis be placed on preparedness and mitigation. Preparedness leads to greater institutional capacity to cope with drought events through the creation of an organizational structure that improves information flow and coordination between and within levels of government. Drought preparedness, coupled with appropriate mitigation actions and programs, can reduce and, in some cases, eliminate many of the impacts associated with drought. Further, the socio-economic impact of the drought that droughts leave on the quality of life of the people, warrant immediate responses from the community and the community, over the time, has been able to evolve quite a number of coping strategies for survival. Such practices have helped rural poor to survive through the difficult times and have also undergone transformations influenced by modern techniques and the support provided by the local organizations in most of the cases and by the government in some.

3.2 Maintaining health and nutrition levels during drought

While food security measures do take care of the nutrition and health related issues to an extent, given the complexity and the magnitude of the problems, especially for the vulnerable groups, there definitely a need to exert more emphasis on health and nutrition.

Special measures for vulnerable groups: Given that children, women and aged people remain the most affected groups, special focus on their needs is urgently required. Although there are some schemes of the government that do focus on health care of woman and child, there has been an absolute absence of any some discussion, efforts or intervention in the case of elderly people. Within this group special attention needs to be paid to the special needs of women who are going through menopause and elderly women.

Service provisions and awareness: Considering the recurrent nature of drought in the Thar, despite the preparedness on the part of community and the government, when the drought strikes there is ought to be mechanisms to deal with the crisis situations such as provision of providing water tankers at the door step for household use. Acute and complicated health situations can be avoided by talking this measure. The fact of the matter is that there is provision for making water available for domestic use in the rural areas, supported and operated by the Government of Rajasthan, however, this is defunct and marred with irregularities and discrepancies. Neither is the community even aware about such service, nor does the state government make any efforts to publicise it. It is an established fact that epidemics strike hard during the times of natural calamities. Availability of adequate health care facilities is also a sine qua non for containing the diseases and ensuring better health. Regular health check ups by organizing health camps, availability of medicines and accessibility to the health care facility, including qualified medical practitioners, in the vicinity are three vital aspects of health management during drought.

Policy Perspectives: Ensuring food security and adequate nutrition for the people in difficult circumstances is a challenge that cannot be surmounted without suitable policy initiatives on the part of the government. In the context of the Thar region, the interventions meant for ensuring food security and nutrition as well as the policy on water need to be coordinated in order to extract maximum benefits for the people of the region. The present policy of supplying water during drought needs drastic change, as it is neither economically feasible nor sustainable. The root of the problem lies in the depletion of groundwater, meeting more than 90 % of rural drinking water

needs. It requires serious review of the Water Policy of the State. The water sector is administered by several government departments and organizations and, therefore, there is a need for an appropriate water policy and institutional arrangements for coordination in the management of water resources for both.

Programmatic interventions of the state such as Mid Day Meal Scheme (MDMS), Integrated Child Development Scheme (ICDS) and National Maternity Benefits Scheme (NMBS) are some of key programmes that are aimed at improving nutritional status among children and women. With the legislative sanction accorded to these schemes through the National Food Security Act 2013, access to these schemes has become a legal right. Consumption of atleast a minimum level of calories and protein as prescribed in the new law, could be an encouraging factor and a first step towards ensuring food and nutrition security and, thereby a healthy life for children and women. A similar corollary can also be drawn as regards the targeted public distribution system (TPDS) that is aimed at providing food grains to atleast 75% of rural poor at subsidized rates. Given that TPDS is also part of the new law now, eligible households in the can receive five kilograms of food grains per person from the local fair price shop at the rate of Re 1 per kilogram from wheat, Rs 2 per kilogram for rice and Rs 3 per kilogram for other coarse grains¹⁸. Although similar benefits have been available in the past, it is encouraging that some of these, as mentioned above, have been imparted legal impetus.

The fact that the health and nutrition of older people needs also its due focus should be taken cognizance of while devising any strategy for provision of health and nutritional needs of vulnerable groups. Future policy and programmes should take cognizance of these issues. The other shortcoming of the State response is that it is relatively less sensitive to livestock issues. The State is neither supportive of people's traditional strategy of animal migration nor of building buffer stocks of fodder. To build a fodder bank in the State, special steps should be taken during a good agriculture year within Rajasthan, and by neighbouring States together to provide fodder at lower cost and stock it in areas where it is most needed.

In the backdrop of the abovementioned recommendations, it is also equally important to recognise and affirm the role of the state and the duty bearer and assert the fact that the provision of services and implementation of welfare schemes is primarily a state responsibility. While there is a fair degree of optimism surrounding such initiatives also needs to be seen in the context of the success rate of their implementation. Problems of operations as well as wrongful inclusion of beneficiaries have always been perennial issues that have been matters of concerns for any social policy initiatives. Although, there are a number of structure and systemic problems, the need to monitor the schemes by independent agencies at the implementation level has been felt across the board. Organisations such as GRAVIS, need to play a proactive role in monitoring the implementation of scheme and continuing advocacy with the state on the importance to be given to the issues of health, hygiene and nutrition. Spaces such as the provision of social audits of schemes and programmes should be explored and claimed effectively.

Such an approach must also be complemented with the use of locally sound sustainable techniques with required innovations are guided by the vision to promote community participation at various level of interventions – from problem identification to implementation.

¹⁸Schedule I of the National Food Security Act 2013,

This has imparted robustness to efforts and has generated acceptance among the community about even relatively fresher initiatives of GRAVIS.

3.3 Research and development

The use of available information technology through continuous research and development and the need to further explore the strategies adopted to meet the health and nutrition related needs are some areas that require further research:

Understanding drought: Research and development initiatives especially in areas like understanding the monsoon behaviour, Agrometeorology, arid / dryland farming systems and hydrology have been contributing substantially to the knowledge base on drought management. However, the issue is that such knowledge is not being converted into technology to help cope with the drought conditions in rural areas. Although there have been some efforts towards this, the rate to which the agrarian community in the Thar is getting benefiting of it is severely low. There is a greater need to convert this knowledge into user friendly technique especially for the small and marginal farmers.

Ground water availability and its recharge: More detailed research needs to be conducted to quantify natural groundwater recharge processes in different parts of the state and to define safe limits for groundwater use. In Rajasthan, particularly in the western region, data on hydrological processes at field, basin, region and state level, are sparse and, in many areas, doubtful. Therefore, there is a need for extensive data collection through hydrological instrumentation. Efforts should be made to develop suitable hydrological and water resource models for the prediction and utilization of water resources.

There is also long-felt need to develop a strong network to share the limited database for better planning and management of water resources in drought-prone regions. These advancements have contributed in the past towards developing useful technological options and also infused dynamism in agricultural production strategies and development of appropriate farming systems. Of late, the drought management approach has shifted significantly in the region from crisis response to risk management through early warning systems, advance planning for emergency response and better preparedness, yet the sustainability in rainfed areas is yet to be achieved.

Techniques of purifying available water: Given that the quality of water is a major concern in the Thar region, there is a need to research the contamination related issues and their effects on the health of people. However, most urgent in this regard is the need to find a solution which may be offered by suggesting pragmatic ways of purifying the water. Further research and innovation will be required to ensure that safe drinking water is made available to the people of Thar from the ground water sources.

Assessment of welfare schemes: The fact that despite several schemes programmes aimed at women and children have not been able to bring down the number of malnourished and underweight children and women and make considerable dent in the appalling status of health profile in the Thar Desert, can be explained in the poor implementation of these programmatic interventions. There is definitely a need to assess the impact of such interventions, such as those meant for school going children. Such an agenda must also prioritise exploration of the potential of these schemes and the innovations required for the same. Civil society organisations in partnership with the government agencies could consider carrying out such assessments.

Especially vulnerable groups: As mentioned, children in the age groups of 0 to 6 years, school going children, adolescents, women and older people are different categories that have special but distinctive nutritional needs. While GRAVIS has made some efforts in understanding the problems and needs of elderly people in a more systemic manner, there is a need to mainstream such discussions especially as regards the elderly people, into the discourse on nutrition and food security. Further studies will be required to establish this need and build advocacy efforts in this direction, primarily focusing on the impact of droughts and malnutrition on elderly and especially elderly women. This could hopefully result in some special intervention programmes on this issue by the governments which have been virtually nonexistent so far.

Food security, health and nutrition, are contingent on each other and get affected directly by the drought and water scarcity. While immediate response is essential, the need to have an integrated and holistic approach is of primary importance. Such an approach takes into its purview the identification of key factors that affect food security, health and nutrition during droughts, build the capacities of the communities to defy its adverse effects and keep on innovating sustainable alternatives that are financially viable and effective at the same time.

GRAVIS has been adhering to such approach in the past and has been able to make breakthrough the difficult terrains of the Thar by introducing sustainable solutions for food security and health. Further work, however, is required to explore some of the under explored areas, documenting and innovating strategies and also evolving replicable models.

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Acronyms

BMI	Body Mass Index
CESCR	Committee on Economic Social and Cultural Rights
GHI	Global Hunger Index
ICDS	Integrated Child Development Scheme
ICESCR	International Covenant On Economic Social and Cultural Rights
IMR	Infant Mortality Rate
MDMS	Mid-Day Meal Scheme
MMR	Maternal Mortality Ratio
NFHS	National Family Health Survey
NFSA	National Food Security Act 2013
NMBS	National Maternity Benefit Scheme
PHC	Primary Health Care Centre
TPDS	Targeted Public Distribution System
VHF	Village Health Funds
WHO	World Health Organisation

NOTES

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This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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 of the Thar Desert to enable them to help themselves. Since its inception in 1983, GRAVIS has worked with over 55,000 desert families across over 1200 villages in Rajasthan reaching a population of over 1.2 million, and has established over 2,800 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 the region.



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Diffuser - Protects the top of the sand and the biolayer from being damaged when water is poured into the filter.

Biolayer - A community of micro-organisms that live in the top 1-2cm of the sand. The micro-organisms eat some pathogens in the water, helping the filter treat the water better.

Filtration Sand -

Removes pathogens and suspended solids from water. The filtration sand is specially selected and prepared to treat the water well.

Separation Gravel -

Supports the filtration sand and prevents it going into the drainage gravel and outlet tube.

Drainage Gravel -

Supports the separation gravel and prevents it going into the outlet tube.

Lid - A tightly fitting lid prevents contamination and pests in the filter.

Outlet Tube - After the

water flows down through the sand and gravel, it collects in the tube the bottom of the filter. Gravity pushes the water up the tube, and it flows out the end of the tube on the outside of the filter.

Safe Water Storage - A

water container with a lid and a tap protects the water from being contaminated again.