

DROUGHT, HEALTH AND COMMUNITIES

A research study on drought's impact on health

Gravis

IDEX

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2010

GRAVIS

Written by
Dr. Neetu Sharma

With support from
The team at Gravis

Study conducted by
Gramin Vikas Vigyan Samiti (Gravis)

3/437, 3/458, M.M. Colony, Pal Road
Jodhpur 342 008 Rajasthan, India
Phones: 91 291 2785 317, 2785 116
Fax: 91 291 2785 116
Email: email@gravis.org.in
www.gravis.org.in

Supported by
International Development Exchange (IDEX)
www.idex.org

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Acronyms

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FOREWORD

Drought and community health have been inextricably linked together over a long period of time. With its deep impacts on water and food availability, sanitation and livelihood options, droughts have been in the roots of health problems of communities living in arid zones. The Thar Desert of India is certainly one of such regions where drought's impact on health is strongly visible.

The health problems caused by droughts range from diseases arising from lack of hygiene, and from conditions originated due to malnutrition, to reduced immunity, and to high prevalence of infectious and non-communicable diseases. While drought impacts all populations groups, most vulnerable remain women, children and elderly the groups with which GRAVIS has worked extensively over the years.

Drought mitigation has been a strong component of GRAVIS work methodology, and activities focusing on community health in the light of persisting droughts have been in the fore-front of planning discussions and implementation phases. A study focusing on drought and health was certainly required to illustrate the need and thought on future approach.

We are thankful to International Development Exchange (IDEX), our long standing partner, for their generous support in conducting this study. We hope the study will be successful in its attempt to giving shape to drought and health talks and to leading the way to drought mitigation with improved health.

Dr. Prakash Tyagi
Director, GRAVIS

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AUTHOR'S NOTE

Scarcity of water is the phenomenon the community in the Thar has been living with and that in way determines the quality of life of the people of this desert. The prolonged periods of scanty or no rain leaves multiple effects on the socio-economic, physical, psychological and cultural aspects of peoples' lives; health being the most vulnerable yet most overlooked.

The fact that the rural community in the Thar desert primarily depends on either agriculture or cattle rearing for their livelihood, maximizes their susceptibility to the drought. Lack of access to adequate food required for survival leads to malnourishment and deficiencies that are common in this area, women, adolescent girls and children being the worst hit. Because of the very less quantity of water available maintaining basic hygiene also becomes a challenge leading to several infectious diseases.

Regular occurrence of drought also has indirect affects on the health of people. Large scale migration caused due to inadequate rains results in the import of HIV AIDS and other sexually transmittable diseases. However, the most startling and undocumented phenomenon is the impact that the drought leaves on the mental health and status of people especially women who at times find it very difficult to deal with the stress and depression caused due to the pressures of maintaining the household single handedly and also taking care of children and elders at home.

As in the case of other natural calamities, early warnings should be part of any plans aiming to deal with drought, which would entail further research and development in this area. Nonetheless, drought management can be effective only if there are sound water management techniques for rain water harvesting and efficient use of water are put to practice.

Yet, there is an urgent need to identify sustainable solutions to the problem by devising a policy on the use of water that takes cognizance of the rural realities and also to explore some resource intensive measures. However, a comprehensive approach that takes into account traditional systems and synergises it with the government policies and schemes, prescribing corresponding and complementary role for the community, civil society and the state, only can work as a panacea for the drought stricken community of the Thar.

This study seeks to provide an insight into the effect of drought on the lives of people in general and on health, in particular, and makes an attempt at suggesting possible drought preparedness, management and mitigating measures.

The author expresses heartfelt gratitude to Mr. Omprakash Bairwa, State Project Director, MPOWER for being kind enough in sparing his valuable time and helping the author by sharing experiential insights on the subject. The study would not have been possible without the support from project and field staff at GRAVIS and the enriching experience sharing by the rural community and the community leaders.

Dr. Neetu Sharma

Centre for Child and the Law (CCL)

National Law School of India University (NLSIU)

Bangalore

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PART 1 : Introduction

The Thar Desert is one of the most barren landscapes on the earth that receives somewhere between 100 mm and 200 mm of rain in a year at average. A population of over 23 million people makes it the most densely populated desert eco-system in the world. Harsh climate, dry conditions and extreme water scarcity characterize life in Thar. In spite of severe water shortage, agriculture and animal husbandry remain to be the mainstay of economy in the region. Frequent droughts also cause mass-scale migration from the desert especially of male youths to surrounding cities and states in search of employment. Migration causes social problems within the society, which vulnerable sections of society in isolation, particularly women, children and elderly.

Healthcare facility is a major concern in many parts of India including the remote and rural areas of the Thar Desert. Scarce availability of healthcare facilities and low literacy levels further contribute to the under-developed status of the region.

People in Thar are highly deprived by scarcity of food & water. *Approximately 50%* of villages rely on a single source of water. Rain-fed agriculture and scattered settlement in Dhani are responsible for scarcity of food and water in the region. The impact of vast distance between *dhani* & source of water directly influences the lives of women, children, elderly and disabled people. Shortage of drinking water poses severe health threats. The communities are often affected by water-borne diseases and by medical problems caused by lack of water dehydration. Extreme conditions, nutritive deficiency and less attention towards health lead various gynaecological and reproductive infections among women.

Over the last 12 years or so, GRAVIS and IDEX have ventured together on a number of developmental themes ranging from income generation and human rights to drought mitigation through water and food security and micro-finance. Various GRAVIS-IDEX initiatives benefited over 20000 deprived people of village population. Currently, GRAVIS is implementing the Drought Preparedness Program (DPP) with the support of IDEX, which is being implemented in 20 remote and needy villages of the Thar Desert emphasizing on water and food security, women empowerment, training and capacity building and healthcare.

The present research seeks to understand the overall impact of the water scarcity and drought on the lives of rural community in general and on community health, in particular. An attempt has been made through research study to advocate for drought mitigation measures and to establish its link with improved health.

The study aims at studying the general community experience on drought and the impact of scarcity of water & drought on community health. Specifically it looked at the health problems led by drought and water scarcity with a view to understand existing models of Drought Preparedness Thar and also to suggest a sustainability plan for the region. An attempt has also

been made in the study to establish correlation between drought and public health among the most vulnerable and marginalized sections of society and to understating community perception on healthcare, collecting people's knowledge on healthcare provision and its consequence.

A combination of methods that were used to conduct the study that included field visits to the rural areas of Rajasthan and interviews with community, community leaders, Village Development Committee and the Self Help Group members in addition to llooking at the secondary resources available on the impact of drought on the lives of rural community and community health in particular. Exchange of ideas with the healthcare providers and medical/public health experts was also critical to the study.

The study, adopting a logical flow, looks at the 'drought' as a climatic as well as social phenomenon, takes into cognizance its regional manifestations and variations, prior to analyzing the impact of water scarcity on the rural community in Thar and health of the rural poor. It also attempts at suggesting sustainable strategies for coping with the drought through alternative means and water conservation.

PART 2 : Drought: A climatic and social phenomenon

Drought is a weather-related natural disaster. It affects vast regions for months or years. It has an impact on food production and it reduces life expectancy and the economic performance of large regions or entire countries. It is, however, a recurrent feature of the climate and occurs in virtually all climatic zones, though its characteristics vary significantly among regions. Drought differs from aridity in that drought is temporary; aridity is a permanent characteristic of regions with low rainfall.

Drought is an insidious hazard of nature. It is related to a deficiency of precipitation over an extended period of time, usually for a season or more. This deficiency results in a water shortage for some activity, group, or environmental sector. Drought is also related to the timing of precipitation. Other climatic factors such as high temperature, high wind, and low relative humidity are often associated with drought. Unlike many disasters which are sudden, droughts result when there is less than normal precipitation over an extended period of time, usually a season or more. The decreased water input results in a water shortage for some activity, group, or environmental sector.

Drought is more than a physical phenomenon or natural event. Its impact results from the relation between a natural event and demands on the water supply, and it is often exacerbated by human activities. The experience from droughts has underscored the vulnerability of human societies to this natural hazard.

2.1 Characteristics of Drought

The characteristics of a drought may be very different from one region to another. Other possible causes are delays in the start of the rainy season or timing of rains in relation to principal crop growth stages like delay in rain or pre-monsoon rain. High winds and low relative humidity can make matters much worse. Drought can also occur when the temperature is higher than normal for a sustained period of time; this causes more water to be drawn off by evaporation.

Drought is difficult to define precisely, but operational definitions often help define the onset, severity, and end of droughts. No single operational definition of drought works in all circumstances, and this is a big part of why policy makers, resource planners and others have more trouble recognizing and planning for drought than for other natural disasters. In fact, most drought planners now rely on mathematic indices to decide when to start implementing water conservation or measures in response to drought.

It is also imperative to distinguish between aridity and drought, being the first one the

² The Disaster Handbook 1998 National Edition Institute of Food and Agricultural Sciences, University of Florida, IFAS publication DH 1605. Adapted from the National Drought Mitigation Center, University of Nebraska- Lincoln

Every crop has a cycle and water is required at different times of growth. If the rain comes at the time of harvest or any other time when water is not required, it is normally detrimental to the crop.

permanent state of low rainfall in certain areas on Earth (a desert is a very arid region), while Drought is a temporary event (there can be a drought in the Amazons, but this is not an arid region).



Comparison between an arid zone (left) and a humid zone suffering from drought (right)

2.3 Types of Drought

Scientists from various fields have looked at drought and its manifestations in various regions from varied points of views. Research by Donald A. Wilhite, director of the National Drought Mitigation Center, and Michael H. Glantz, of the National Center for Atmospheric Research, in the early 1980s uncovered more than 150 published definitions of drought. Basically these definitions manifest the variations in the nature of drought across various regions. Wilhite and Glantz categorized their collection of definitions into four basic approaches to measuring drought: meteorological, hydrological, agricultural and socioeconomic. The first three approaches deal with ways to measure drought as a physical phenomenon. And the last deals with drought in terms of supply and demand, tracking the effects of water shortfall as it ripples through socioeconomic systems.

Meteorological Drought

Meteorological drought is defined usually on the basis of the degree of dryness (in comparison to some “normal” or average amount) and the duration of the dry period. Definitions of meteorological drought must be considered as region specific since the atmospheric conditions that result in deficiencies of precipitation are highly variable from region to region. For example, some definitions of meteorological drought identify periods of drought on the basis of the number of days with precipitation less than some specified threshold. This measure is only appropriate for regions characterized by a year-round precipitation regime such as a tropical rainforest, humid subtropical climate, or humid mid-latitude climate. Locations such as Manaus, Brazil; New Orleans, Louisiana (U.S.A.); and London, England, are examples. Other

4 The Disaster Handbook, National Edition Institute of Food and Agricultural Sciences, University of Florida, 1998.

5 Wilhite, D.A.; and M.H. Glantz, Understanding the drought phenomenon: The role of definitions. *Water International* 10, 1985

climatic regimes are characterized by a seasonal rainfall pattern, such as the central United States, northeast Brazil, West Africa, and northern Australia. Extended periods without rainfall are common in Omaha, Nebraska (U.S.A.); Fortaleza, Ceará (Brazil); and Darwin, Northwest Territory (Australia), and a definition based on the number of days with precipitation less than some specified threshold is unrealistic in these cases. Other definitions may relate actual precipitation departures to average amounts on monthly, seasonal, or annual time scales.

The following are the examples of “meteorological droughts” from different countries at different times show why it is a poor idea to apply a definition of drought developed in one part of the world to another. Under any circumstances, meteorological measurements are the first indicators of drought.

United States (1942): less than one tenth inch of rainfall in 48 hours
Great Britain (1936): fifteen consecutive days with daily precipitation totals of less than one hundredth of an inch
Libya (1964): when annual rainfall is less than 7 inches
India (1960): actual seasonal rainfall is deficient by more than twice the mean deviation
Bali (1964): a period of six days without rain.

Source: The Disaster Handbook 1998 National Edition, Institute of Food and Agricultural Sciences, University of Florida, 1998.

Agricultural Drought

As the name suggests, this definition of drought keeps the agricultural activities at the epicentre while explaining drought. Agricultural drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced ground water or reservoir levels, and so forth. Plant water demand depends on prevailing weather conditions, biological characteristics of the specific plant, its stage of growth, and the physical and biological properties of the soil. A good definition of agricultural drought should be able to account for the variable susceptibility of crops during different stages of crop development, from emergence to maturity. Deficient topsoil moisture at planting may hinder germination, leading to low plant populations per hectare and a reduction of final yield. However, if topsoil moisture is sufficient for early growth requirements, deficiencies in subsoil moisture at this early stage may not affect final yield if subsoil moisture is replenished as the growing season progresses or if rainfall meets plant water needs.

Hydrological Drought

Hydrological drought is associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (i.e., stream flow, reservoir and lake levels, ground water). The frequency and severity of hydrological drought is often defined on a

watershed or river basin scale. Although all droughts originate with a deficiency of precipitation, hydrologists are more concerned with how this deficiency plays out through the hydrologic system. Hydrological droughts are usually out of phase with or lag the occurrence of meteorological and agricultural droughts. It takes longer for precipitation deficiencies to show up in components of the hydrological system such as soil moisture, stream flow, and ground water and reservoir levels. As a result, these impacts are out of phase with impacts in other economic sectors. For example, a precipitation deficiency may result in a rapid depletion of soil moisture that is almost immediately discernible to agriculturalists, but the impact of this deficiency on reservoir levels may not affect hydroelectric power production or recreational uses for many months. Also, water in hydrologic storage systems (e.g., reservoirs, rivers) is often used for multiple and competing purposes (e.g., flood control, irrigation, recreation, navigation, hydropower, wildlife habitat), further complicating the sequence and quantification of impacts. Competition for water in these storage systems escalates during drought and conflicts between water users increase significantly.

Socioeconomic Drought

Socioeconomic drought is what happens when physical water shortage starts to affect people, individually and collectively. Or, in more abstract terms, most socioeconomic definitions of drought associate it with the supply and demand of an economic good. The present study primarily concerned with this aspect of drought.

Socioeconomic definitions of drought associate the supply and demand of some economic good with elements of meteorological, hydrological, and agricultural drought. It differs from the aforementioned types of drought because its occurrence depends on the time and space processes of supply and demand to identify or classify droughts. The supply of many economic goods, such as water, food grains, fish, and hydroelectric power, depends on weather. Because of the natural variability of climate, water supply is ample in some years but unable to meet human and environmental needs in other years. Socioeconomic drought occurs when the demand for an economic good exceeds supply as a result of a weather-related shortfall in water supply. For example, in Uruguay in 1988-9, drought resulted in significantly reduced hydroelectric power production because power plants were dependent on stream flow rather than storage for power generation. Reducing hydroelectric power production required the government to convert to more expensive (imported) petroleum and stringent energy conservation measures to meet the nation's power needs.

2.4 Causes of Droughts

Shortage of rainfall coupled with its erratic distribution during rainy season causes severe water deficit conditions resulting in various intensities of droughts. In India, the seasonal rainfall (monsoon rains) over the Indian sub-continent is a global phenomena associated with large-scale hemispherical movement of air masses. Therefore, identification of the major atmospheric phenomenon that influences the monsoons over Indian sub-continent is essential in drought management research.

Two such relationships, viz., (i) sea-surface temperature anomaly around the Indian sub-continent in relation to atmospheric circulation, and (ii) large-scale pressure oscillation in atmosphere over southern Pacific Ocean are found to be useful in this context. The winter circulation over the sub-continent, extended period of occurrence of western disturbances (late in the season), strengthening of heat low over North Western India in summer and shifts in zonal cells over India are some of the important parameters that influence monsoon system over the country.

Some of the researchers are of the opinion that the sea-surface temperature anomaly in the monsoon path is more important in predicting the monsoon rather than the pressure difference at far off places in the globe. Such studies have been initiated, but definite conclusions are yet to be arrived at. Therefore, successful prediction of monsoon over different parts of the country is still a problem and any progress in this direction will help in forewarning the occurrence of droughts.

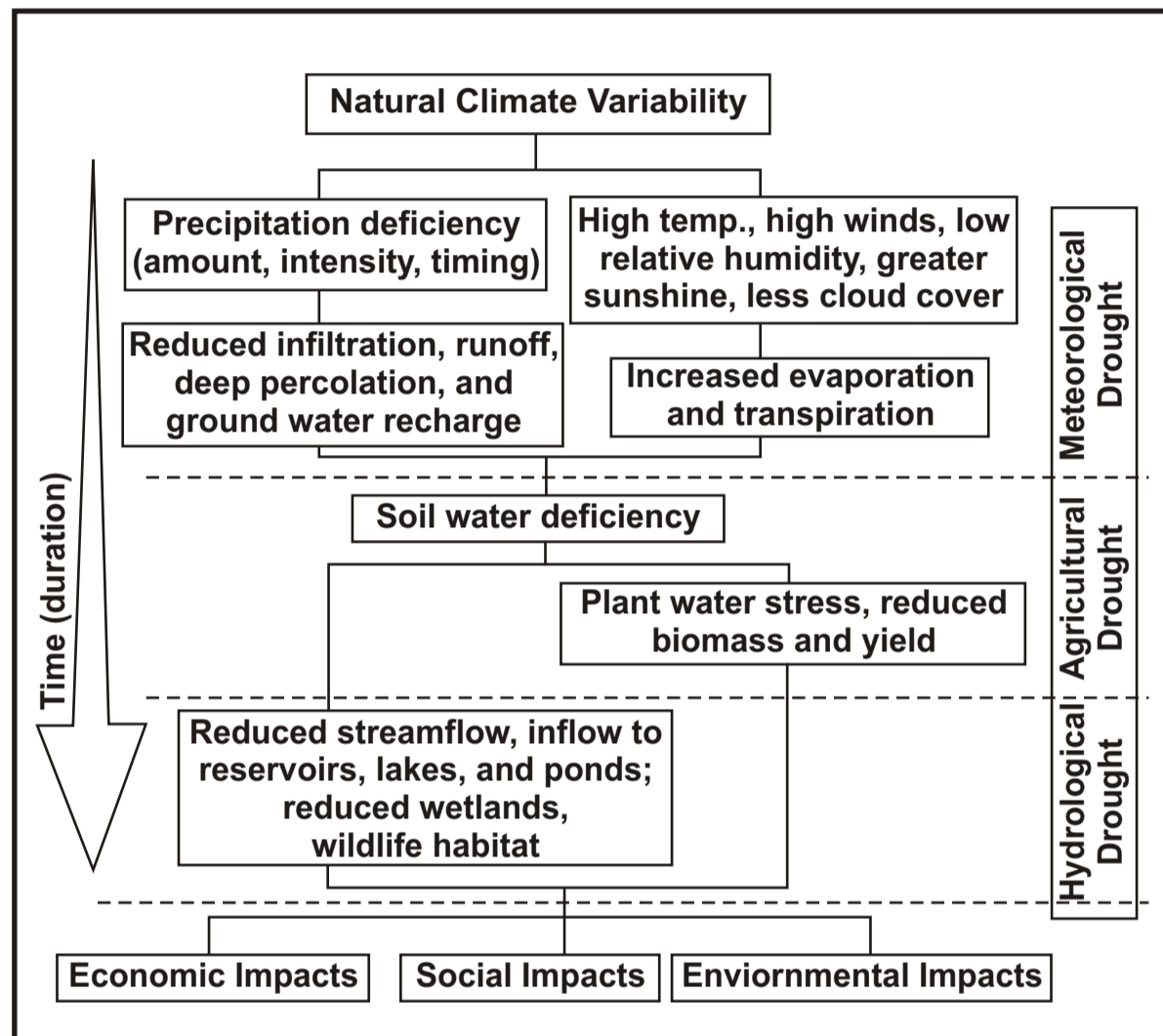
2.5 Impact of Drought

The following picture shows the various stages of drought and the way it affects the agricultural activities and the socio economic conditions.

The sequence of impacts associated with meteorological, agricultural, and hydrological drought further emphasizes their differences. When drought begins, the agricultural sector is usually the first to be affected because of its heavy dependence on stored soil water. Soil water can be rapidly depleted during extended dry periods. If precipitation deficiencies continue, then people dependent on other sources of water will begin to feel the effects of the shortage. Those who rely on surface water (i.e., reservoirs and lakes) and subsurface water (i.e., ground water), for example, are usually the last to be affected. A short-term drought that persists for 3 to 6 months may have little impact on these sectors, depending on the characteristics of the hydrologic system and water use requirements.

When precipitation returns to normal and meteorological drought conditions have abated, the sequence is repeated for the recovery of surface and subsurface water supplies. Soil water reserves are replenished first, followed by stream flow, reservoirs and lakes, and ground water. Drought impacts may diminish rapidly in the agricultural sector because of its reliance on soil water, but linger for months or even years in other sectors dependent on stored surface or subsurface supplies. Ground water users, often the last to be affected by drought during its onset, may be last to experience a return to normal water levels. The length of the recovery period is a function of the intensity of the drought, its duration, and the quantity of precipitation received as the episode terminates.

6 What is Drought?, *The Disaster Handbook*, National Edition Institute of Food and Agricultural Sciences University of Florida, 1998.



Flow chart illustrating the progression of drought, and the relationship between Meteorological, Agricultural, and Hydrological Drought. Economic, social and environmental impacts are shown at the bottom of the chart, independent of the time scale, indicating that such impacts can occur at any stage during a drought. (National Drought Mitigation Centre, <http://www.drought.unl.edu/whatis/concept.htm>)

In the most general sense, drought originates from a deficiency of precipitation over an extended period of time, resulting in a water shortage for some activity, group, or environmental sector. Whatever the definition, it is clear that drought cannot be viewed solely as a physical phenomenon.

PART 3 : Drought and water scarcity in Thar Desert

Map of Rajasthan



Rajasthan is located in the northwestern part of the subcontinent. It is bounded on the west and northwest by Pakistan, on the north and northeast by the states of Punjab, Haryana, and Uttar Pradesh, on the east and southeast by the states of Uttar Pradesh and Madhya Pradesh, and on the southwest by the state of Gujarat. The Tropic of Cancer passes through its southern tip in the Banswara district. The state has an area of 342,239 square kilometres. In the west, Rajasthan is relatively dry and infertile; this area includes some of the Thar Desert, also known as the Great Indian Desert. In the southwestern part of the state, the land is wetter, hilly, and more fertile.

Drought is a recurrent phenomenon in the Thar. In every 100 years there are 7 years of acute drought, 27 years of scarcity, 63 manageable years and 3 normal years. There is no province or district in the country where famines occur so frequently.

*Saat kaal, sattais jamana, tirsath koria kacha
Teen Kal, aida padela, maa poot mile na pachcha*

It means that in a century there will be seven years of drought. Twenty seven years will be good harvest. Sixty three years will be neither good nor bad. Three drought years will be so severe that mother and son will be separated from each other never to meet again.

(The lines above are traditional expression in the local language of Thar used to explain the extent of drought in the region and the way it penetrates the lives of rural community.)

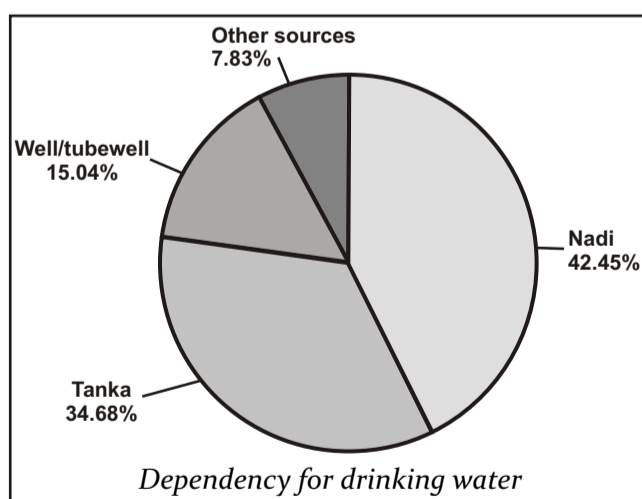
The state of Rajasthan has only 1% water resource, whereas area is 10% & population 5.1% of the entire country. 12 districts, which comprise 60% of the area of the state, fall within the Great Indian Desert or Thar. Thar is the most populated desert in the world. 64% of its population resides in the Thar despite scanty rainfall with all its variations, timing and intensity.

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.

3.1 Sources of water in the Thar

The dependency of the population on sources of drinking water in western Rajasthan is shown in the following figure. 42.5 percent of the population depends on *Naadis*, 34.7 percent on *Taankas*, 15.0 percent on open wells and tube wells and 7.8 percent on other sources. From July to September, people generally use *Naadi* water, which is open to evaporation losses, and they save the water in other sources like *Tankas* for the period of scarcity. For the sake of convenience, a *Taanka* is refilled by transporting water from other sources. In May and June, after the stored water in *Naadis* and *Tankas* is exhausted, dependency on open wells, tube wells and other sources increases.



With regard to agriculture and the related activities the farmers largely depend on the rain, which is erratic and scarce in this region. Keeping this in view there have been some traditional ways of water conservations that are applied to use the water to its maximum potential. One of these is *Khadin*, or an elevated boundary built around the cultivated land that ensures the water could get accumulated and the moisture could be retained in the soil for a longer period of time.

Another relatively recent kind of water conservation technique used by the farmers is anicut which is a form of dam constructed to conserve rain water to use it for agricultural purposes.

3.2 Impacts of Drought on Community

The impact of drought on the overall economy of the country is evident at macro (State and national level) and microlevels (village and household levels); however, impacts could be direct or indirect and vary in nature and intensity. The extent and intensity of drought impacts is determined by prevailing economic conditions, the structure of the agricultural sector, management of water resources, cereal reserves, internal and external conflicts, etc. Microlevel impact is largely on the entitlement to produce and procure food. The impact varies depending upon the social structure (class, caste) and village and household resource endowments.

The direct impacts of drought can be classified under four broad categories, viz. physical, social, economic and environmental. The initial direct physical effects of drought on the production sectors are similar regardless of the type of economy, although the relative and absolute magnitudes of each impact will depend on specific country characteristics. Drought entails a loss of assets in the form of crop, livestock and productive capital damage as a direct consequence of water shortage or related power cuts. In the industrial sector, agro-based industries are the ones directly affected, as the lower domestic production of agro-processing inputs reduces non-agricultural production. Domestic availability of water is also restricted. This latter aspect has implications for health and household activities, including the time required for collecting water.

Droughts have potentially important implications for government policies, first and foremost, via their impact on the budgetary balance. A drought is likely to reduce tax revenue via a decline in income, employment and exports. On the expenditure side, increased expenditure on relief, social welfare, health and water supplies, consumption-related subsidies on food distribution, and the logistical costs of drought-related imports may confront government. Law and order services could also be put under greater pressure by a rise in crime, in turn associated with

10 *Taanka* is a rain water harvesting technique wherein water is directed to underground tank through artificial prepared catchments. The water accumulated thus is used for domestic work. Though originally found in the desert towns, the system has since gained immense popularity in the rural areas.

11 *Khadin* is the structure constructed to ensure the use of run-off water to recharge groundwater aquifers.

12 *Anicut* which is kind of dam to conserve water during the rains and use in during the time of drought or water scarcity.

13 Benson, C. and Clay, E. *The Impact of Drought on Sub-Saharan African Economies: A Preliminary Examination*, Technical paper No.401. Washington, D.C., World Bank, 1998.

temporary unemployment, migration and increased destitution. In addition, these are likely to be pressures for the increased provisions of subsidies and credit to affected productive sectors, including public utilities. Government policies can exacerbate the impacts of drought.

The effect of drought at village and household levels is equally significant. Drought can result in considerable intensification of household food insecurity, water related health risks and loss of livelihoods in the agricultural sector. The agriculture is the first to be affected by drought and considering that most of the rural household in Thar are either small and marginal farmers or pastorals the impact of drought on the rural households and livelihoods can be seen visibly.

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.

For the rural community that largely rely for their livelihoods on their livestock, drought deprives them from even the two square meals. The Impact of drought on livestock is manifested in four ways;

- (i) mortality,
- (ii) loss in productivity,
- (iii) health of animal,
- (iv) loss in fertility.

Goats and sheep are also affected by drought, but relatively mildly compared to large animals. They are mainly grazing animals and depend on common property resources i.e., grazing lands, wastelands, forests etc. In case of widespread drought, they are taken out of the State, and in the worst situation sold for slaughter, as there is a round the year market for them. 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.

3.3 Impact on livelihood

At micro level, it is ultimately the livelihood of people that is affected by drought in many ways. Firstly, food availability decreases as agriculture fails and livestock perish. Secondly, income decreases because of loss of agricultural employment and forced change of occupation. Thirdly,

depending upon the severity of drought, people are forced to migrate in search of jobs within or outside the State. Fourthly, people are forced to sell assets or borrow money. All these factors contribute to making them financially insecure for the years to come.

Change in occupation and migration are also most visible features that constitute the overall impact of drought on the lives of people. Drought in 2002-03 had a significant impact on the occupations of people, as 80% of farmers were forced to join the labour force, both at relief sites and outside villages. People also migrated from villages to nearby towns or agriculturally better endowed areas or outside the State.

3.4 How drought has impacted the lives of rural poor in Thar

The Thar, as mentioned, has been an incessant victim of drought and water scarcity has almost become a way of life for most of the rural community. Multi-fold effects of the lives of people in rural areas of Thar have been recorded during the research visits that were paid to various revenue blocks in Jodhpur district that can easily be generalised for most of the Thar Desert with negligible variations.

The people in the Thar desert primarily depend on the rain for all their water related needs, be it for drinking water, household use or agricultural. If there is no rain in the region in a particular season or year the entire lifecycle and the life style of people gets altered. There have been instances where there was no rain in particular geographical area for the past three to four years and, good rain which is required for cultivating crops has been elusive for seven to ten years at a row. The impact of drought on agriculture have already been discussed and as mentioned it has detrimental effect for the livelihoods since most of the rural population depend either directly or indirectly on subsistence farming by growing the crops for their household use. Most of these rural household become food insecure in such situation that leads to further deterioration of their standard of living as well.



Older people are the best source of traditional wisdom

Another critical aspect of the impact of drought on agriculture is the frequency of rainfall. At many occasions, farmers in a particular geographical region, sow the seeds after a good spell of rain, whereas the problem arises when after investing in the seeds and the cost of getting the field sowed, it does not rain within a couple of weeks. In the dry season, stormy sand winds because depletion in the soil and the seeds are also wasted in the process, leaving the farmers without food grains for the consecutive periods. More often than not such a situation occurs in the rural areas and the poor farmers end up losing even the grains that they would have used for domestic consumption.

14 Rathore, M. S., State Level Analysis of Drought Policies and Impacts in Rajasthan, Working paper 93, Drought paper 6, International Water Management Institute, 2004



A drought impacted pond

If there is no rain for consecutive years in that particular geographical region the rain water does not even get accumulated of water in the area and consequently the water table in that particular geographical area goes further down, and water scarcity further deteriorates if this situation prolongs.

In the lack of subsistence crops villagers are required to buy food grains from the market that are normally very expensive and not to rule out the possibility of borrowing money with high interest rates that further affects their economic condition adversely. The economic pressure is also worsened in most of the situations where water needs to be bought from various other sources such as the private water suppliers or nearby water wells owned by few influential people. It was observed during the field research that on an average a rural house holds ends up spending about Rs 300 to 700 per week on water purchase, which is a major chunk of their net incomes, in most of the cases 50 to 60%. This amount varies on the basis of the availability and distance of the source of water. In cases of prolonged drought also this amount may go further up.

The story goes like this:

One of the women in the *Shivpura* village in Phalodi block told about the practice of keeping water under lock and the key remains with the wisest old person of the house and he or she only decides when to *spend* it and how much. This was apparently done to prevent *wastage* of water in the households.

Drought in a particular area in Thar normally affects the standard of living of a rural household and pushes them down the ladder of economic development. The family income gets stressed given the acute shortage, higher demand and the increased prices of water, leaving them unable to afford other household goods as well as nutritious food.

For the cattle rearing community it also becomes difficult to sustain and feed their cattle as not only the water supply but the supply of fodder also gets restrained. The effect of water and fodder scarcity on the livestock is very prominent. The productivity comes down and the access to the otherwise easily available dairy products also

The scarcity of water and the distance of the sources of water require rural women and young girls to fetch water from 6 to 7 kilometers of distance and on an average they end up spending about three to four hours in a day collecting water for household needs. In such situation the role of females in the society gets affected adversely limiting their roles as social actors in the community. Women are not able to do any other work to substantiate their livelihoods and for young girls continuing their education becomes a challenge. Most of the rural girls in the Thar are thus deprived of a regular system of education that affects their lives as adult women, family equations and the society at large where the females are mostly illiterate not only about their rights but also about the importance of education for their children. Gender equations in the family and society also consequently remain largely in favor of males because of this phenomenon. This was primarily witnessed in the case of all the villages visited where males were heading nearly all the major decision making bodies at the village level.

Loss of livelihood that is caused due to drought and subsequently the agriculture and livestock also result in large scale migration in the Thar region. In most of the cases small and marginal farmers as well as the agricultural laborers migrate to either cities or to the neighboring states, leaving their families behind most of the times to fend for themselves.

It is pertinent to note here that most of the pastoralist who make a living through cattle rearing are most affected that have to travel even to neighboring states along with their cattle herds on the look out of greener pastures. In such cases wherein most of the times only male members temporarily migrate, the duration of such stay is much longer than the usual internal migration within the states. It was reported as long as six months in some cases. Few cases of the permanent migration also came into light where the entire family has relocated to a different geographical area, sometime to another district and sometimes to another state itself.

The prevalent phenomena of change of profession and migration have resulted in several socio-cultural transformations as well as conflicts and tensions, subsequently manifested in the socio-economic texture of the society. All such alterations in the society have been direct consequence of the water scarcity and prolonged droughts in the region.

Another such critical issue is the import of HIV/AIDS to the Thar region which is primarily

because of the large scale of temporary migration of the males in the houses. Women are at a great risk of getting infected and in the absence of any awareness the ante natal care also the chances of they infants being positive are also higher. According to a study HIV/AIDS infections average as high as 8.2 percent in some pockets of rural Rajasthan and this, to a certain extent, be attributed to the large scale temporary migration by the rural folk.¹⁵

The fact of the matter is that:

In one the villages in the Bap block, people take bath in a small tub which is kept underneath while taking bath and then the same water is used for either washing clothes for cattle. Such practice is prevalent even now in some of the remote villages in Thar where rain has been elusive for many years.

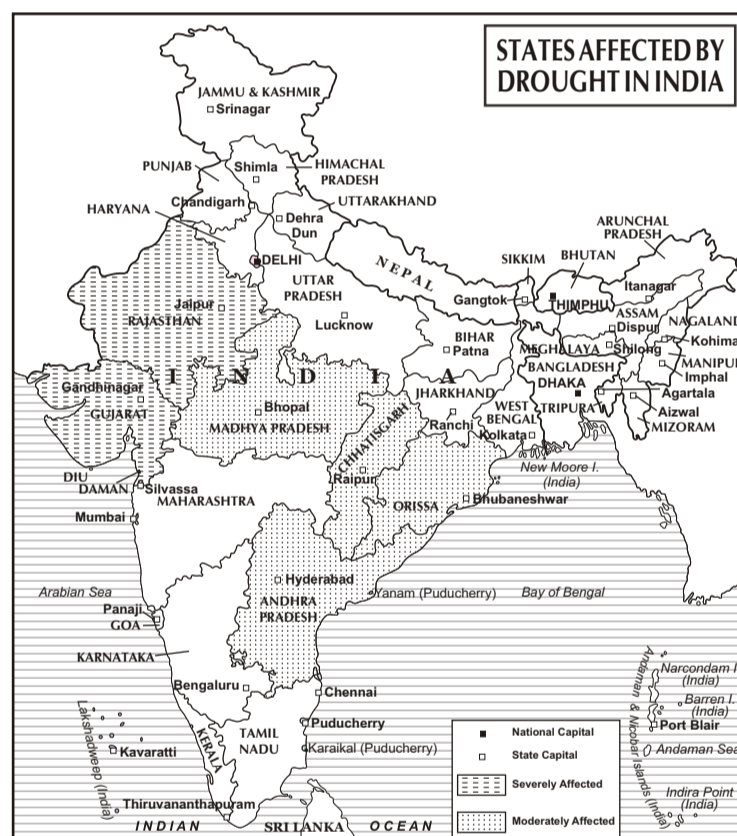


A group discussion

PART 4 : Drought and its impact on Community Health in Thar

4.1 Drought in India

Over 68% of India is vulnerable to drought. The 'chronically drought-prone areas' around 33% receive less than 750 mm of rainfall, while 35%, classified as 'drought-prone' receive rainfall of 750-1,125 mm. Large parts of the country perennially reel under recurring drought. The drought-prone areas of the country are confined to peninsular and western India primarily arid, semi-arid and sub-humid regions. An overwhelming majority of cropped area in India around 68% falls within the medium and low rainfall ranges. Large areas are therefore affected if the southwest monsoon plays truant. The major drought years in India were 1877, 1899, 1918, 1972, 1987 and 2002



An analysis of 100 years of rainfall data reveals that the frequency of 'below-normal rainfall' in arid, semi-arid and sub-humid regions is 54-57%, while severe and rare droughts occurred once every eight to nine years in arid and semi-arid zones. In these zones, rare droughts of severe intensity occurred once in 32 years, with almost every third year being a drought year. The 1987 drought was one of the worst droughts of the century, with an overall rainfall deficiency of 19%. It affected 59-60% of the crop area and a population of 285 million.

16 Drought in India: Challenges and Initiatives, Poorest Areas civil Society Programme (2001-2008), available at http://www.corecentre.co.in/Database/Docs/DocFiles/drought_india.pdf

Marwar (Jodhpur state) faced drought and famine from 1309 to 1313 AD during the reign of Rao Rajpal. Later, in 1570 AD, Emperor Akbar dug the Kukar Talao in Nagaur. Most parts of the country were ravaged by famine in 1783, remembered as *chalisa*. The famine of 1812-13 is referred to as *panchkal*. The 1848 famine led to mass migration from Ajmer in Rajasthan. The state was struck again in 1868-69, 1877-78, 1891-92 and 1899-1900.

The most recent, the drought of 2002, ranks fifth in terms of magnitude but is unique when examined in overall terms of magnitude, spacing, dispersion and duration. In July 2002, rainfall deficiency dropped to 51%, surpassing all previous droughts. The impact of the drought spread over 56% of the land mass and threatened the livelihoods of 300 million people across 18 states. The 2002 monsoon was one of the shortest in recorded history. The total loss in rural employment due to shrinkage of agricultural operations during the drought months was estimated at 1,250 million man-days. The GDP in agriculture shrank by 3.1%. The estimated loss of agricultural income was around Rs 39,000 crore.

While erratic monsoons and drought are intertwined, a host of other reasons, mostly manmade, aggravate drought or create drought-like situations in the country. India, after all, is well-endowed in terms of rainfall, with Cherrapunji receiving an annual rainfall of around 11,000 mm. Even Saurashtra and the Kutch region record rainfall of around 578 mm. India's average rainfall is around 1,170 mm yet the country suffers recurrent drought.

India has seen a sharp decline in groundwater levels, leading to a fall in supply, saline water encroachment and the drying of springs and shallow aquifers. Around 50% of the total irrigated area in the country is now dependent on groundwater, and 60% of irrigated food production depends on irrigation from groundwater wells.

The rapid depletion of forest cover is also seen as one of the reasons for water stress and drought. India has a forest cover of 76 million hectares, or 23% of its total geographical area much lower than the prescribed global norm of 33%. Although the scientific evidence is inadequate, forest-water linkages are widely acknowledged, especially the watershed functions of forests, greater availability of water, less soil erosion, more rainfall, flood and landslide control, etc. Combined with these and a host of other factors poor irrigation systems, pressure from the increasing industrial use of water, is the appalling indifference displayed towards rainwater harvesting.

Little has been done over the years to drought-proof the country, when community-based rainwater harvesting measures could easily accomplish this feat. Even Cherrapunji, which has the highest annual rainfall in the country and is one of the wettest places on earth, faces water shortages for nine months in a year primarily because all this water is not harvested.

Most major droughts in India have been followed by recession. Annual Gross Domestic Product (GDP) growth was negative in 1957-58, 1965-66, 1972-73 and 1979-80.⁸ The 1990s, however, reveal

a different picture, unlike in the '50s when a decline in agriculture had a significant bearing on both industrial and overall GDP. Although there have been certain schemes and programmes to contain the influence of drought on the agriculture, this has been primarily through crisis management and by the way of drought preparedness. This explains the marginal improvement in rural agricultural community's situation despite high investment in drought relief programmes.

4.2 Community health in Thar

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. What makes the situation with regard to community health in the Thar complex is fact that most of such factors act negatively leading to a general health of 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.

National Family Health Survey II 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 65 per 100 and Maternal Mortality Ratio is 388, which are much higher than the National average.

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. 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. Further, lack of interest among medical practitioners who are generally not interested in working in remote rural areas. The difficult terrain of Thar further discourages medical practitioners to work here. Also it is very difficult to monitor those who work there. Many government doctors are guilty of absenteeism from Primary health centres.

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 still marred with the high levels of malnutrition and prevalence of preventable and curable diseases.

17 Ministry of Water Resources, <http://mowr.gov.in/index.asp?langid=1>

18 Indian Agricultural Research Institute (IARI). http://www.iari.res.in/index.php?option=com_content&view=article&id=427&Itemid=1253

19 Community Health in Thar.

4.3 Impact of Drought on Health

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.

▪ Access to nutritious food

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

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.

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 but not throughout the year. Since meat is not eaten because of the cultural reasons, it remains a challenge to reach an optimum level of nutrition.

Deficiencies

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.

Common Diseases

In addition to the aforementioned health related problems encountered by the community, it was noticed that there are several diseases that are very much wide spread across the region and the cases of such diseases are also generally higher than the other parts of the country.

- Most of the rural community is compelled to store water for longer period of time. Although, many of the households have adequate storage facility such as *tanka*, a large number of population especially in the remote villages still have to rely on the water which is either naturally available, like ponds or have to store it in some artificially made small pond, which in most of the cases is kept open and used by mosquitoes as breeding ground. This results in large number of cases of malaria even during less rainfall.
- 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.
- 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.
- 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.

Diseases and Women

As mentioned, iron deficiencies in women have detrimental effects on their reproductive

health and this is one of the primary reasons for high infant mortality rates in the region. 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.

Livestock

Diseases and deficiencies in cattle, especially cows, goats and sheep, also affect the health of people in general. There have also been instances of calves having physical abnormalities. This not only is because of the scarcity of water and fodder but also due to the impurities in the fodder that people buy from market. This is a major reason that affects the productivity and consequently health of people.

Hygiene and health

Water is a scarce commodity in Thar region and even the availability of drinking water is also limited. In a scenario people do not have enough water to drink or cook for their meals, bathing and maintaining hygiene otherwise are not priorities. This leads to, in addition to skin allergies, recurrent liver and stomach related infections and diarrhoea. The stomach and intestines are vulnerable to infection from contaminated food and water. The most common mode of transmission is the facial-oral route; through which contaminated intake endure in body.

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.

Stress and mental disorders

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.

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 in a big way. 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.

Migration and HIV/AIDS

As mentioned elsewhere large scale migration of males is very much rampant in the Thar Desert. Most of the times such temporary migration prolongs ensure the continuous flow of family income. In many such cases, males of the family come back infected with HIV/AIDS and end up communicate it to their wives and subsequently to children in the lack of appropriate awareness about the disease and how it spreads.

Access to Healthcare Facilities

Although not a direct result of drought, inaccessible health care facilities in the remote areas of Thar also add to the agonies of the rural poor. This is primarily because the government's health infrastructure is not accessible to them because some of the villages are more than 40 kms away from any government hospitals and they have to spend for medicines. In such remote villagers where monitoring of the functionaries is difficult, primary health care workers and ANM who in many cases do not make regular visits to the villages. The difficult terrains also make it difficult for the government functionaries to reach there.

Musalmano ki Dhani in Jemla village is a very remote hamlet located close to the Jaisalmer district border, there is no electricity, (some money was collected about 5 years ago but electricity has not come as yet) no water, no schools in the village, migration is rampant, very limited work being done even by the NGOs, access road is also not proper. Selling of cattle to survive is also rampant, Livestock in the village has seen about 80% decreases during the time of drought. Surprisingly only few families were listed as BPL in the 2001 census and have now started getting wheat at 2rs x25 kg per month, others do not benefit from these and have no information about any government schemes. Some old women said that earlier it used to rain every alternate year, but it has not rained for about 10 years.

PART 5 : Suggested drought preparedness model for Thar Desert

5.1 What is Drought Mitigation or Preparedness?

Drought preparedness and management are effective strategies to reduce risks and therefore the impacts associated with droughts. Preparedness for drought necessitates greater institutional capacity at all levels of government and more efficient coordination between different levels of government. Preparedness also implies increasing the coping capacity of individuals and communities to deal with drought events.

Mitigating drought taking actions in advance of drought to reduce its long-term risk can involve a wide range of tools. These tools include policies, activities, plans, and programmes. Most commonly, there are three components in a drought plan: monitoring and early warning; risk assessment; and mitigation and response. Given the improved tools and technologies available today, it is possible to provide drought information that enables action to maximise the probability of successful crop production and/or minimise the potential damage to established crops and other assets. To this end, information should be provided on the timing, intensity and duration and the spatial extent of droughts. An equally important element of drought early warning systems is the timely and effective delivery of this information to decision makers. To provide effective drought information, there should be improved collaboration among scientists and managers to enhance the effectiveness of observation networks, drought monitoring, prediction, information delivery, and applied research. Such collaboration could help foster public understanding of and preparedness for drought.

5.2 State Response to Drought

Most of the districts in Rajasthan are prone to recurrent drought and the state government of Rajasthan has taken it into cognizance while framing policies and programmes, however, going by the field experience, this has not been able to help the rural community resolve their problems. Following are the few initiatives of the Government of Rajasthan that aim at alleviating poverty, especially the drought stricken rural poor.

5.2.1 Rural Development Programmes

Since Independence, a large number of Rural Development Programmes (RDP), such as infrastructure development (roads, communication, and electrification), market network, new crop technology based on seed-fertilizer-irrigation inputs, and watershed development, were initiated with different objectives of poverty reduction, drought mitigation and relief. These programmes include:

- National Watershed Development Programme for Rainfed Areas (NWDPA) and Integrated Watershed Development Programme (IWDP)
- Drought Prone Area Development Programme (DPAP)
- Desert Development Programme (DDP)
- Employment Generation Programme (EGP)

21 Sivakumar, M.V.K., and Wilhite, D.A., Drought Preparedness and Drought Management, World Meteorological Organization, Geneva, Switzerland, National Drought Mitigation Center, University of Nebraska, Lincoln, Nebraska, USA

22 Rathore, M. S., State Level Analysis of Drought Policies and Impacts in Rajasthan, Working paper 93, Drought paper 6, International Water Management Institute, 2004.

- Rural Poverty Alleviation Programmes, including Individual Beneficiary Programmes, Rural Infrastructure Development, Tribal Area Development, Drinking Water Supply programs etc

All these programmes, although have been evolved keeping the rural community in the epicentre, have fallen short in achieving their objectives owing to the structural inadequacies and administrative issues related to implementation. All such programmes, while useful to an extent, have not been able to meet up to the needs and requirements of the people in the drought prone areas. All such problems could have had more impact if they took the cognizance of the resource specifics in drought prone areas and relate them to the indigenous adaptations and coping strategies of the people.

Similarly, generalized institutional programmes like land reforms, community development, projects, Panchayat systems etc., extended to these areas, without assessing their potential impacts on sub-marginal lands, common property resources and climatic uncertainty. Public relief strategies to help drought-affected people were designed and pushed to such a level that they have more or less displaced the people's own adjustment mechanism and generated strong dependence on public relief. Irrigation facilities were developed in a few pockets, but used on crops requiring a lot of high water and in the areas well endowed with water.

Market integration took place, but it had serious adverse impacts on the strategic self-provisioning system and fragile resource base. Some initiatives (like the Drought Prone Area Program) followed a development process suitable for better endowed areas. All this indicates the need for understanding and explicit consideration of specifics of drought prone areas in both development strategies and drought management.

The major impact of these efforts has been that during periods of serious droughts, large scale migration of human and cattle population does not take place, the capacity of the system to respond to the needs of the population has increased, and a certain amount of resilience has also been developed to face the challenge. Nevertheless, during periods of severe droughts, the population living below the poverty line (BPL), landless agricultural labourers, small and marginal farmers still require government support for provision of employment, fodder, drinking water etc.

5.2.2 Public Distribution System

The Public Distribution system (PDS) in India, which started as an ad-hoc war-time measure to mobilize food supplies to prevent undue rise in price with a network of 47,400 outlets the Fair Price Shops (FPS) is now one of the largest systems in the world. The concept of PDS has evolved in the wake of critical national level food shortages in the 1960s, as a major policy instrument to provide essential commodities to the people, particularly the weaker section of the society, on an assured and regular basis at reasonable prices. It also works as an effective anti-inflationary measure and makes a significant contribution in raising the nutritional standard of the poor. In the earlier period, PDS was considered to be urban biased, but gradually the rural areas were well served by it.

PDS has played a limited role in providing food grains access to the poor, despite having been in operation for four decades. The Impact of PDS on poverty and nutritional status was assessed as minimal and at an exorbitant cost.

23 Jharwal, S.M., *Public Distribution System in India*. New Delhi, Manak Publication, 1999.

From a drought mitigation and management point of view, the PDS networks have played a significant role in distribution of 17.45 million tones of food grain through its' outlets all over India. The network is available for drought relief work and is effective in distribution of essential commodities to drought affected population.

5.2.3 Food Assistance Programmes

Both Central and State Governments have initiated many programmes to increase access to food. The most popular ones include: provision of 25 kg of wheat or rice at low prices to families below poverty line (BPL), allocation of 3 kg of food grains per child per month for school children in classes between I and V, provision of two bags of wheat kept with village head for free distribution to a person or household in the village not having access to food and starving, etc.

The main shortcoming of these programmes is that they only target the poorest in the population. Apart from the BPL population, where chronic food shortages prevail, even households not normally deprived of food are rendered vulnerable in the regions prone to droughts. In terms of social category based on caste and class distinctions, the general understanding is that scheduled tribes, agricultural labourers, marginal and small farmers are the most vulnerable section. Not only actual food distress, but also even the threat of future food shortages can become a powerful instrument in shaping the behavioural patterns of those affected by it. Children are the first affected by this distress, as they are forced to join the labour force.

5.2.4 Food for Work Programme /NREGA

The National Food for Work Programme was launched in November, 2004 in 150 most backward districts of the country, identified by the Planning Commission in consultation with the Ministry of Rural Development and the State governments.

The objective of the programme was to provide additional resources apart from the resources available under the Sampoorna Grameen Rozgar Yojana (SGRY) to 150 most backward districts of the country so that generation of supplementary wage employment and providing of food-security through creation of need based economic, social and community assets in these districts are further intensified. The scheme was 100 per cent centrally sponsored. The programme has since been subsumed in National Rural Employment Guarantee Act which came into force in 200 identified districts of the country including 150 NFFWP districts. The Act provides 100 days of work guarantee to every rural household whose members volunteer to do unskilled manual work.

As mentioned elsewhere, this many of the rural poor rely on the NREGA for their living during the drought when they are unable to cultivate crops. However, there has been plethora of problems attached to it. NREGA employment is available only for 100 days and people go unemployed rest of the year. It was observed that this programme is also marred by widespread corruption and there are irregularities in the payments. Because of all these problems these NREGA has not been used to its potential to curb the financial problems of the villagers during prolonged drought.

5.2.5 Kisan Credit Cards (KCC)

Kisan Credit Card Scheme aims at provision of adequate and timely support from the banking system to the farmers for their cultivation needs including purchase of inputs in a flexible and cost effective manner. Beneficiaries covered under the Scheme are issued with a credit card and a

pass book or a credit card cum pass book incorporating the name, address, particulars of land holding, borrowing limit, validity period, a passport size photograph of holder etc., which may serve both as an identity card and facilitate recording of transactions on an ongoing basis. However, as reported by the farmers and the organizations working with them, most of the times the benefits of these cards are accessible only to the large scale farmers and not the small and marginal farmers. Also, as in the case of other government schemes this has also been the victim of bureaucracy and red-tapism in the government machinery.

While all these programmes have been in force for the past some time, the people in the villages continue to bear the brunt of the water scarcity. This has primarily been the result of the lack of perspective while designing the strategies to deal with drought like situations, that normally focus on crisis management only rather than envisaging a sustainable preparedness model. It is also observed that the modern techniques that are resource intensive do not take into account the regional variations and tend to generalize the problem and thereby the solutions as well. Many a times such measures have looked at the immediate way outs and the sustainable long term remedies to tackle the drought like situations. Lack of coordination among various levels of such measures, i.e., community, state government and the central government has also taken the toll of their effectiveness. It is imperative that institutional mechanisms, state level interventions and other such schemes being run by either the state government or central government are harmonized in order to leverage from their potential.

5.3 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.

The approach to drought in the past has been generally reactive and response oriented, i.e. through crisis management. Critical issues that could be addressed as integral parts for reducing the impact of drought may generally include the following:

- 1 Supporting and strengthening the programmes for the systematic collection and processing of meteorological and hydrological observations,
- 2 Building and strengthening scientific networks for the enhancement of scientific and

24 <http://saarc-sdmc.nic.in/pdf/drought.pdf>

technical capacities in meteorology, hydrology and other related fields,

- 3 Developing an inventory of water resources indicators and indices,
- 4 Development and dissemination of vulnerability/risk assessment tools
- 5 Vulnerability assessment under different environmental conditions,
- 6 Dissemination of drought planning methodologies that could be adopted by drought-prone areas in the preparation of plans,
- 7 Improved understanding of the drought climatology (frequency, intensity, and spatial extent) of drought patterns,
- 8 Understanding the principal causes of drought at local regional and global levels,
- 9 Development of standardized products / indicators for specific use, including hazards assessments,
- 10 Improvement of the monitoring, modelling and prediction capacities and improved communication of how this information can be applied in decision support,
- 11 Support all initiatives related to the promotion of Early Warning Systems,
- 12 Development of national and regional drought and disaster management policies,
- 13 Support development of regional networks for drought preparedness that would enhance regional capacity to share lessons learned in drought monitoring, prediction, preparedness, and policy development,
- 14 Development of comprehensive drought reduction strategies that emphasize monitoring and early warning, risk assessment, mitigation, and response as an essential part of drought preparedness,

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.

While evolving a drought preparedness model for the Thar region, aforementioned ground rules can be taken account of. Not only such model aim at prevention and preparations but also offer tangible and pragmatic suggestions that take cognizance of the ground realities, such as socio-economic conditions, traditional practices as well as peculiar geographical conditions in the region.

Following are few areas that can be focused on while evolving such model:

Early warnings

Based on such research, the possibility of evolving early warning systems can be explored. Such system where the forecast could be made would help the government machinery as well as the local community level structures to equip themselves and give them the opportunity to gear up to deal with the emergency situation and thereby responding to them. All other endeavours to cope with drought, such as transportation of water tankers and grains, ensuring the availability of adequate medical support, information facilitation among farmers and encouraging them not to cultivate water intensive crops, etc. can be coordinated. Appropriate arrangements can also be made for making fodder available for the livestock so that the related impact of drought could be minimised.

Further research and development

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.

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.

Rainwater Harvesting

India receives most of its rainfall in just about 100 of 8,760 hours in a year. It is imperative that this water is captured and stored for use during the rest of the year. Around 100 mm of rainfall a year, on one hectare of land, even in Barmer (one of the driest regions in India) can yield up to 1 million litres of water enough to meet the drinking and cooking water needs of 182 people at a liberal 15 litres per day.⁷ Of course it's difficult to capture all the rainwater, but even if a plausible 50% were harvested it would mean half-a-million litres a year!

According to estimates, the land required to meet the drinking water needs of an average Indian village varies from 0.10 hectares in Arunachal Pradesh (average population: 236), where villages are small and rainfall high, to 8.46 hectares in the Delhi region where villages are big (average population: 4,769) and rainfall low. In Rajasthan, the land required varies from a mere 1.68 to 3.64 hectares in different meteorological regions; in Gujarat it varies from 1.72 to 3.30 hectares. Every village in India can, therefore, meet its own drinking water needs if simple water harvesting measures are taken up. Anything more that's harvested can be used for irrigation and other purposes. Yet little has been done in this regard, barring a few exceptions of community-led initiatives, exposing the country and its hinterland to drought.

²⁵ Agrometeorology is a branch of meteorology that studies the effect of weather and climate on agriculture.

²⁶ A *beri* is a percolation well that stores rainwater in a flask-shaped structure. These *beries* are built in the relatively impervious clay beds of ponds and preserve water for the driest periods, when ponds run out of water. *Beri* are community/family wells found mainly in the drier regions of Rajasthan and are used mainly for drinking water.

²⁷ P. Narain, M. A. Khan and G. Singh, Potential for Water Conservation and Harvesting against Drought in Rajasthan, India, Working paper 104, Drought Series Paper 7, International water management Institute, 2009.

Water management through Traditional Systems

The traditional systems of water harvesting, like the bawari, jhalara, naadi, taanka, khadin and beri, etc., prevalent in the region over centuries, are still viable and cost-effective. If these systems are improved and utilized on a large scale, they can meet the requirements of drinking water of the rural population and mitigate the drought impact at least partially. In addition, modern rainwater technologies, such as *anicuts*, percolation tanks, injection wells and subsurface barriers, are highly effective in rejuvenating depleted groundwater aquifers.

With the existing and proposed rainwater harvesting structures in the Jodhpur district, over 68 MCM of water will be available even during severe droughts, which may suffice to meet nearly 69 percent of the requirements of drinking water in villages.

Drought and Agricultural practices

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.

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.

Growing crops that require less water has been in practice in the deserts. It is important to encourage the farmers to concentrate on cultivating grains and fruits that require less water. These include grains such as bulgur wheat, *mung* beans, millet, chilli and oilseed.

Crop rotation is another such practice that the farmers have been adopting for ages now in the region. Research has proven that this practice if followed in a systematic way can actually help retaining the fertility of the soil besides enhancing the productivity.

Livestock Management

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 the food security. There are a number of measures that can be taken to ensure for the same:

Fodder management: 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 pasture lands: Availability of green pasture lands is critical to the survival of and protection of livestock. Community pasture lands in the Thar, which are called *oran*, are used for cattle grazing can be expanded and protected to ensure enough fodder for cattle in the area.

Veterinary Services: In the land of sand where there is a dearth of medical practitioners is a reality, medical facilities for the cattle are absolutely negligible. However, the importance of adequate medical support for livestock in the region must be recognized and veterinary services must be made available at the local level.

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 of 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 same cases, however these efforts are required to be invigorated and intensified in order to ensure sufficient alternative livelihood for the rural community.

Other traditional Practices for 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 of Horticulture units

Service provisions

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 taking 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 publicize it.

Food supplies to the most affected areas must also be ensured and the public distribution system can be used for the same. It must be ensured that the rural poor gets grains and other staples without any charges, during the time of distress. Malnutrition and deficiencies caused due to water scarcity can be dealt with effectively to a certain extent by such measures.

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 on Water

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

livelihood security and drought mitigation. The role and responsibilities of these organizations should be clearly defined to avoid overlap and to ensure active management of water resources at all levels.

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.

Joining of rivers

Inter-basin water transfer, though expensive, is a permanent solution to the desertification of water-scarce regions, at least in India. Policies need to be developed and executed to interlink rivers for water transfer to the drought-prone regions of western Rajasthan. At present only a small parts of the state is served through inter-basin water transfer.

A coordinated approach to drought preparedness in Thar

As mentioned above, drought mitigation and preparedness requires a fresh look to be taken for greater research and development efforts focused to new tools and approaches as well as the required paradigm shift in technology development. Such an approach must ensure the involvement of the community and stakeholders at various levels that in turn would ensure the integration of local or indigenous coping mechanisms.

Further, to operationalize these strategies education and awareness of policy makers and the public regarding the importance of improved drought preparedness as a part of integrated water resources management

Role of various stakeholders

Active participation of all the stakeholders and local elected bodies in water management should be ensured for its successful implementation. The government, civil society as well as the rural community is required to work in tandem while dealing with the drought and the drought like situations effectively. While the government must ensure the availability of the requisite infrastructure in terms of health care facilities, provision of food grains and safe drinking water; the civil society organization can generate awareness about the innovative mediums of water conservation and help building the capacities of the farmers and rural community in judicious use of water. Even more important is the awareness generation with regard to the health and hygiene, apart from the information generation and dissemination of various means of water storage and conservation.

Issues related to water management in Rajasthan are highly complex and need to be resolved through the involvement of government departments, research institutions, NGOs and other stakeholders. There is a need to evolve a multi pronged strategy involving water conservation, alternate livelihood schemes, water management and also service facilitation by providing water at the doorstep. Huge funds are made available as drought relief to make provisions of water, food and fodder, for income generation, etc. Policies should be enacted to develop water resource structures on a permanent basis. As estimated, all the drought-relief funds for a drought year may be enough to develop rainwater harvesting structures that could provide at least drinking water to all in drought-vulnerable western Rajasthan.

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Acronyms

AIDS	Acquired Immuno Deficiency Syndrome
ANM	Auxiliary Nurse Midwife
BPL	Below Poverty Line
DPP	Drought Preparedness Programme
FPS	Fair Price Shop
GDP	Gross Domestic Product
GRAVIS	Gramin Vikas Vigyan Samiti
HIV	Human Immuno-deficiency Virus
IART	India Agriculture Research Institute
IDEX	International Development Exchange
KCC	Kisan credit Cards
PDS	Public Distribution System
MCM	Million Cubic Meters (of water)
NFFWP	National Food For Work Programme
NREGA	National Rural Employment Guarantee Act
NFHS	National Family Health Survey
NGO	Non Government Organization
RDP	Rural Development Programme
SGRY	Sampoorna Grameen Rozgar Yojana
USA	United States of America

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 50,000 desert families across 850 villages in Rajasthan reaching a population of over 1 million, and has established over 1,100 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.

Gravis

3/458, 3/437, MM Colony, Pal Road, Jodhpur, 342008 Rajasthan, India.

Phone: 91 291 2785 317, 2785 116 Fax: 91 291 2785 116

Email: email@gravis.org.in, www.gravis.org.in