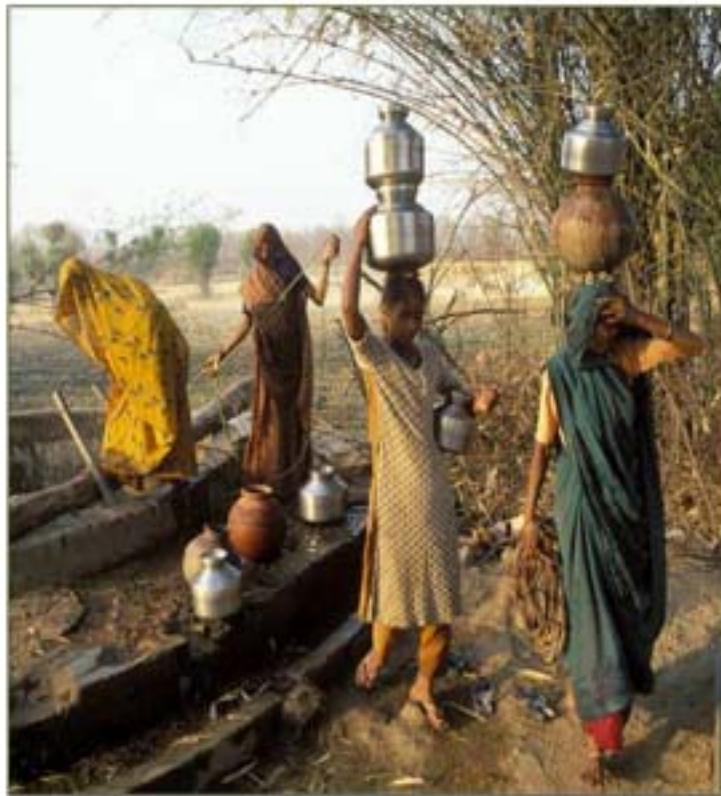


Linking Climate Adaptation

- a Case Study on Successful Community Level Adaptation



Prepared by



Development Alternatives

in collaboration with



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Climate Change Centre, Development Alternatives, works on global environmental issues such as global warming, climate change, sea level rise, desertification and deforestation. Economic and policy analysis of global environmental mechanisms is an important part of Climate Change Centre's activities. The activities of the Centre are broadly three fold; research on operational and applied aspects of climate change, technical assistance to industry and other stakeholders in taking up clean development mechanism projects, and outreach and awareness generation among different stakeholder groups.

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*The Development Alternatives Group believes that the key to achieve sustainable development is the **creation of sustainable livelihoods in large numbers***

*Sustainable livelihoods implies..... informed and empowered communities
.....with access to dignified and viable income generation opportunities
.....and a clean and healthy environment*



Introduction

The historic and continued high rates of green house gas (GHG) emissions from various anthropogenic sources are responsible for enhanced greenhouse effect resulting in global warming and climate change. The atmospheric lifetime of these greenhouse gases ranges from decades to centuries. As a result, the impacts of global climate change, signatures of which are already visible, are expected to continue and even increase in the coming years. Climate change is not only a major global environmental problem but also an issue of great concern to a developing country like India. Climate change is likely to threaten food security, increase water stress and decrease its availability, result in sea level rise, and increase the occurrence of diseases like malaria. Lack of resources and access to technology and finances coupled with high dependence of majority of the people on climate sensitive sectors viz. agriculture, forestry and fisheries have made India seriously concerned with the possible impacts of climate change. Therefore adaptation to climate change is a necessity for India, which is already stressed by population and poverty.





India's Vulnerability to Climate Change

India's Initial National Communication to the United Nations Framework Convention on Climate Change (UNFCCC), assessed the impacts and studied the vulnerability of various sectors in India to climate change and brought out the following, depicting vulnerability

- ➔ Increase in water stress and reduction in the availability of the fresh water.
- ➔ Threats to agriculture and food security, since agriculture is monsoon dependent.
- ➔ Shifts in area and boundary of different forest types and threats to bio-diversity with adverse implications for forest dependent communities.
- ➔ Adverse impacts on natural ecosystems.
- ➔ Adverse impacts of sea level rise on coastal agriculture, fisheries and settlements.
- ➔ Adverse impacts on human health.
- ➔ Increased energy requirement and impact on climate sensitive industries and infrastructure.

The most important climatic feature of the Indian sub-continent is the South-West monsoon during June -September. Almost all regions of the country receive their entire annual rainfall during the summer monsoon, making the people and the agrarian economy, critically dependent on it. The Indian monsoon has a direct link with the Southern Oscillation Index (SOI). Weak Indian monsoons are associated with a large negative SOI and hence occurrence of El Nino, whereas, strong monsoon have been linked to large positive SOIs and consequent absence of El Nino events. The frequency of El Nino events is likely to increase due to climate change, resulting in more droughts.



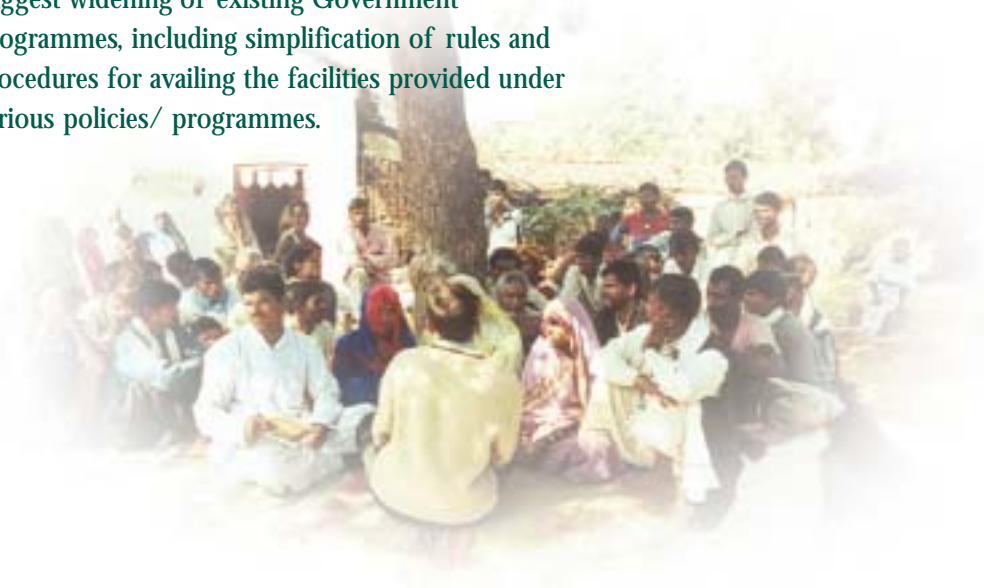


Present Rajasthan Case Study on Linking Climate Adaptation

The case study focuses on the traditional adaptation practices by the vulnerable communities in a drought prone area. The communities have been chosen as they are the people who are bearing the brunt of existing drought. They have evolved over the years the coping measures to increase their resilience against drought. Lately, the local NGO movement also has helped them in taking the initiatives to cope up with such situation. Being in the thick of things, they are best placed to articulate what additional policy and financial interventions are required to build their resilience and coping capacity against droughts.

The study makes an effort to

- Understand the role of traditional coping measures initiated by the communities
- Identify the response measures and policy initiatives already taken up by the Government and other stakeholders (Funding agencies, NGOs);
- Analyse gaps in the existing policies, and
- Suggest widening of existing Government Programmes, including simplification of rules and procedures for availing the facilities provided under various policies/ programmes.





Drought in Rajasthan

The State of Rajasthan experiences an arid, semi-arid climate resulting in severe droughts, the magnitude of which varies from year to year. Drought has been a continuous phenomenon in Rajasthan ever since the beginning of 20th century. The severity of drought has been more in the last couple decades with 1987-88 and 2002-2003 being the most severe ones. The intensity and frequency of drought in Rajasthan has increased and is expected to increase even more in the coming years due to climate change.

Table : Impacts of droughts in recent years

S.No.	Items	1998	1999	2000	2001	2002
1.	No. of villages affected	20069	23406	30583	7965	41000
2.	Affected population (in '00000)	215.07	261.79	330.41	69.70	432.68
3.	No. of cattle affected (in '00000)	295.78	345.60	399.69	69.73	543 48
4.	Crop damages					
	a. Area (in lakh hectare)	64.96	78.18	89.47	26.83	117*
	b. Cost (in million Rupees)	22830	34070	35120	12520	44140
5.	Rainfall reduction	-3%	-16%	-29	-5%	-55%





District Chosen for the Case Study

Based on meteorological evidences, it was found that Tonk district was worst affected by the drought which occurred in year 2002. Tonk district was chosen as the representative survey area because it is located in the heart of Rajasthan. It truly depicted the average climatic variations which took place in the state of Rajasthan.



People living in this area became more and more vulnerable because of non-availability of water for irrigation and reduced fodder for the cattles. Thus, Tonk district suffered the most due to the repetitive occurrence of droughts.

The rainfall situation in the Tonk district; and its deviation from the normal and comparison with two other most severely affected districts is

shown in Table below.

The **present study** was conducted in two severely affected villages in the district of Tonk, Dotana and Safipura, with a population of 1400 and 300 respectively. The average size of the family is six to seven people per household. The main occupation of the people is agriculture and animal husbandry.

District	Normal From 1 st June to 15 th September	Actual From 1 st June to 11 th September	% Deviation to the Normal
Jaipur	443.4	152.0	-66%
Sikar	376.1	165.8	-56%
Tonk	513.5	173.4	-66%

Source: Hydrology Department





Impacts of Drought

The 2002 drought was the fifth year in succession in the state. The intensity of scarcity of water in the year 2002 was much more severe and its magnitude much wider than previous drought years. The major impacts of drought were:

Scarcity of water

There was hardly any water left in the ponds, wells and hand pumps. Nearly 30 percent hand pumps are now dried up and the same percentage (30%) goes for dysfunctional systems.



Reduction in Incomes

- Scarcity of water resulted in massive crop failure in the drought years.
- The daily wages of labourers were reduced from Rs 60-70 per day to Rs 30-40 per day.
- Due to immense crop damage, there was scarcity of fodder and higher prices of available fodder too resulting into abandoning of the livestock
- This reduced incomes as livestock is one of the main sources of income generation

Adverse Impacts on Literacy

Villagers send their children to Government schools as primary education is free. But, some money (in terms of books, minimum annual fees,) is always required to be spent . With successive occurrence of drought, villagers find it difficult to account for even these minimum expenses, so they discontinue their children's education.

Adverse Impacts on Health

Medical facilities are absent in most of the villages. . Hospital is located at the block headquarters, where people go for major health problems. They save money to meet these unexpected expenses. They hire some vehicle to go to the hospital which requires a lot of money and they find it difficult to pay for this transportation, which is over and above the expenditure on treatment.





Role of Women

The women go twice a day to fetch drinking water from nearby wells and hand pumps at normal times and each time it takes ten to fifteen minutes to fetch water.

During drought when the yield from these hand pumps decrease the women are forced to travel longer distance in order to fetch water and the frequency of fetching water also increases. The frequency increases as the available water is less and flow of water is slow.

Moreover, suppose they are carrying two vessels for fetching water, they do not get to fill both the vessels at a time due to scarcity and demand. So they have to be again in the queue to get their second vessel filled, hence the frequency increases. They travel at least 3 Km to fetch water from handpumps which are not near to their houses. They have to wait for longer time to get their turn of filling their pots/vessels. Hence, the time spent in fetching water is tripled (cover longer distance, wait for their turn, frequency increases) during drought, which in turn prevents them from performing other productive activities.

Previously the women could help their husbands in on-field activities. But during drought they could not accompany their husbands to the fields as majority of the time is being consumed in fetching water for the family.

Source : Village Survey

Changing Drought Scenario

- Climate Change Evident

As per perception of the communities, the frequency and intensity of drought were different earlier. Drought was not frequent (did not occur in successive years) and less severe. Moreover the area affected was smaller and sparsely located geographically. Due to this, people affected in one village could go to the nearby areas for resources as well as for job opportunities. Earlier during drought conditions, they used to send their cattle to nearby forest areas and villages for grazing.

Now the production has increased marginally due to better agricultural practices, but the availability per household has declined drastically. The increase in population with reduced land holding size is making people's condition worse to cope up with drought. Drought occurred in the villages earlier also, but now it is occurring in successive years, covering a larger geographic area which is making life miserable for the villagers. With the disappearance of forest cover (due to cutting of trees for fuel wood and for sale of timber), they are finding it difficult to feed their cattle during drought.





Traditional Adaptation Practices

A. Less water-intensive crops:



The land holding size differs from person to person but the average size of land holding is 3 bigha. Due to reduced water availability the farmers have stopped growing crops which require greater amount of water such as cotton. They have successfully adapted to crops requiring less water and started growing cumin seeds, chana and some oilseed crops like mustard. The crops like chana, cumin seeds and mustard were introduced by the local NGO, Kumarappa Institute of Gram Swaraj (KIGS).

B. Storage of Food-grains and Fodder:

The quantity of grains stored for utilisation in future, is sufficient for meeting their requirement only for one year (due to less production). Fodder for cattle is difficult to get during droughts, hence they use mud structures for storing food grains and fodders. The traditional mud structures can preserve the contents for a year or two.



But unfortunately the farmers do not have that much amount of food-grains or fodder to store.



The farmers have over the years through their knowledge and experience could predict the monsoon and spend on inputs (seeds, tillage) accordingly. The sale of stored food grains also depends on their prediction, which normally works well. The older generations are still very efficient in predicting the monsoon.





The main sources of water are ground water and rainwater stored in ponds and wells. Some of the practices adopted by the villagers to get water in water scare situation include activities like digging of new ponds, deepening of existing ponds and wells and bunding of agricultural fields and construction of anicuts.

C. Increasing Water Availability:

➔ *Bunding of Fields*

Large scale leveling of fields and bunding of fields is being practiced by the villagers. They construct med bandhi (contour bunding) in the agricultural field to check water in a piece of land. This reduces wastage of water by allowing the excess water from the field to flow to adjacent fields which are at a lower elevation. Bunding structures thus allow optimal utilisation of water by the crop.



Med Bandhi (Bunding of fields)

➔ *Digging and Deepening of Ponds*

Programmes such as digging new ponds and deepening of existing ponds have been taken up by the villagers on a voluntary basis. However, some of these programmes are also supported by the State Government.





Interventions

A. Introduction of Medicinal Plants

The experts from KIGS introduced “Sona Mukhi” a medicinal plant as a revenue generating plant in arid and semi arid region. It requires less water and minimum care for its growth. The plant is also not being grazed by domestic or wild animals, therefore, there is no need of protection. *Sona Mukhi* is widely used in Ayurveda, Unani, Sidha, Allopathy and other traditional medicines mainly because of laxative property of its aerial parts.



Medicinal plants – Sona Mukhi

Ten (10) kilogram of seeds is required for covering one hectare of land. Cost of one kilogram of seed is a meagre Rs. Two hundred. Seeds, once sown in one hectare of land, generate, Rupees 50 thousand worth of revenues each year, for at least five years. The leaves are used in ayurvedic medicines. The seeds are used for next sowing and as the crop blooms fully at least three times in a year, they also sell the seed in the market.



B. Minimising fertiliser use through vermi-composting:

Application of vermi-composting to increase soil moisture & reduce water requirement of the crops. After the successful field demonstration of the technology the people found it to be a low investment and less cumbersome process and adopted it immediately. This provides two way benefit over use of synthetic inorganic fertilisers. Firstly, the soil fertility and its productivity are not degraded and this is a viable option for sustainable

agriculture. Secondly, they require less of water and inorganic fertilisers, which saves money also. After some capacity building in the technology, now the villagers are able to prepare vermi-compost on their own.





C. Water Management :

The traditional practices adapted by the villagers were not sufficient to meet their demand for water requirement. They are now conserving water by preparing anicuts which helps to store water. This also helps in recharging the ground water in nearby land aquifers and the wells. These communities were not aware of conserving water through anicuts but the awareness generated by local NGOs helped them to practice this conservation structure to get water in water scare situation.



Construction of Anicuts



D. Fodder Crops and Vegetables :

The communities are now growing fodder to a great extent, which is benefiting their cattle as well as enabling them to earn some extra money. Vegetables also provide monetary and nutritional benefits.

E. Formation of Self Help Group (SHG)

The women (numbering around 100) of these villages have formed a self help group known as *Mahila Mandal*. Each women member of the household contributes Rs. 10 per month to a fund managed by 20 women. They lend this money for different purposes like serious health problem, to buy seeds from the market, to dig wells but the decision to lend money depends on the seriousness of the issue. This group was formed three years ago with the intervention made by the local NGO and is still operating.



Discussion with SHG





.....Outcomes of Outcomes of Interventions Interventions.....

- ⇒ **Improved water availability** (*through construction of anicuts*) for
 - **Human consumption** : Unlike earlier years, water for drinking purposes is now available almost throughout the year
 - **Agriculture**: The water conservation structures (anicuts) helped the villagers to get water for irrigating the agricultural fields during winter as well as during the next cropping season.

- ⇒ **Improved incomes through**
 - **Earning revenues** from growing medicinal plants and selling its leaves and seeds which are in very high demand for various purposes
 - **Reclamation of wastelands** by cultivation of medicinal plants
 - **Better cattle rearing** due to improved availability of fodder (because of cultivation of fodder crops)
 - **Cultivation of vegetables**

- ⇒ **Improved water management through**
 - **Cultivation of less water intensive medicinal plants and fodder crops**
 - **Vermi composting** to retain soil moisture

- ⇒ **Enhanced food and nutritional security through**
 - **Diversification of agriculture**: Besides growing adequate staple food crops, due to better availability of water the community is now able to grow vegetables during the winter season, which provides them better revenue, more balanced nutrition and a cushion against crop failure.

..... thus increasing the resilience and coping capacity of the vulnerable community





Linking Climate Adaptation



Improved Water Availability



Improved Grain & Fodder Availability



Improved Nutritional and Health Security





Role of Stakeholders

Government:

➤ Drought Relief Programme

- Food for Work Programme
- Water through tankers in drought affected areas
- Distribution of subsidised fodder for cattle



➤ District Poverty Initiative Programme:

Food for Work Programme

District Poverty Initiative Project (DPIP)

The **World Bank** assisted District Poverty Initiative Project (DPIP) is a major poverty alleviation initiative of the Government. In the year 2000-2001, state government of Rajasthan has started this new scheme, in the seven districts of the state, including Tonk. The scheme period is from July' 2000 to December' 2006.

The main **objectives** are to mobilise the poor in the rural areas and build-up their capacities & utilisation of the available resources on the basis of priorities of poor.

In Rajasthan, DPIP is **implemented through the Department of Rural Development** with the minister of Rural Development at its top. For the implementation of programme, different NGOs are being selected by the State Project Management Unit (SPMU) for a cluster of villages. They help in the implementation of scheme in district and village level. They will appoint Block Coordinator and Community facilitator (CF) (one over 3 villages). Community facilitator will constitute Common Interest Group (CIG) with the BPL families which have common economical and social conditions and which are ready to take common works. After selection of activity, the CIG will **contribute atleast 10% contribution as cash, material or labour and 90% grant** will be provided through the project.

Works under Project:

- **Income related Activities:** Wooden, leather, agriculture, forest produces, fruits, vegetables, dairy, maintenance, sewing, stitching, Pickles etc.
- **Land related Activities:** Watershed development, Anicut, Pond construction and Maintenance, Forestry/Nursery development, Dense forest development, Barren land development, wells for small irrigation & tubewell constructions.
- **Community Activities:** Bridges, Village lane (Khuranja), Nale, Health centres, Anicut, Ponds, Cattle development centre and pasture development.
- **Social Activities:** Lady Nurse/Dais Training, animal breed development, education, health & family welfare programme related activities.

Source: <http://baran.nic.in/departments.htm>





Funding Agencies

(GTZ, CIDA, SIDA, USAID, CAPART, Aga Khan Foundation etc.)

- Funding for watershed development
- Funding for developmental activities conducted by NGOs

NGOs:

The intervention made by the local NGO helped the community to conserve water, to change the cropping pattern and fertiliser use to manage the situation in an efficient manner. Before the intervention made, there were no discussions by women on developmental matters. Now women are coming out and started discussing the problem in meetings and other fora and providing their views as an equal partner to the development process.

Some local NGOs also provided seeds for medicinal plants to the villagers and helped them to sale the leaves in the market at a better price by involving themselves (NGO's) in this process.

Self Help Groups

- Pooling of savings for meeting uncertainties
- Lending money to members when required





Lessons Learned

... .. If we have water we have everything

The communities are aware of their vulnerability and are trying to increase their resilience and coping capacity by practicing various indigenous methods. Besides this, several other factors have also contributed.

Strong presence of local NGO helps

The strong presence of the NGO has benefited the communities beyond their expectations and they sincerely acknowledge it. Only after they got the confidence of the villagers the NGOs were able to work in the villages. Soon the villagers realised the benefits and within a couple of years the NGO was well accepted by the villagers.

Empowerment of villagers absolutely essential

Raising people's awareness about the water crisis occurring in the state is critical. The ways to overcome the crisis should also be communicated to the people. Training should be imparted to the villagers on any innovative technique that are being introduced by any stakeholder. The stakeholder should demonstrate the technique and monitor their performance and only when they find it satisfactory they should handover to the community.

Simpler agricultural risk mitigation schemes required

In spite of repeated crop failure in Rajasthan, the state has not launched an effective crop insurance scheme to minimize losses. The present Crop insurance scheme is not successful due to a number of reasons. The weaknesses are – its coverage has been limited, procedure cumbersome and not clear to farmers and settlement of claims time consuming. Initial implementation has shown its complexity and impracticability.

Lessons learned for Government Programmes

There are a number of Government schemes which, if effectively implemented, can help the villagers considerably. There is a visible gap between planning and implementation. These are due to:

- ➔ Lack of
 - Awareness among the communities to avail the benefits
 - Co-ordination among implementing agencies
- ➔ Delay in initiating Government funded schemes i.e. they generally start only after the failure of monsoon and when damage has already been caused.
- ➔ Complex and cumbersome procedures and modalities for realizing the benefits of Government schemes





Recommendations *to increase coping capacity*

Activities required in drought prone areas

To improve water availability

- ⇒ Construction of smaller but several water conservation/harvesting structures in villages
- ⇒ Promoting traditional water storage structures such as Chandela tanks and *tankas*

To improve water management

- ⇒ Change in cropping pattern towards less water-intensive crops.
- ⇒ Usage of drip irrigation in place of flood irrigation
- ⇒ Promotion of vermi-composting to increase soil moisture
- ⇒ Promotion of traditional water conservation methods such as 'med-bandhi'

To improve incomes

- ⇒ Promote cultivation of saleable produce such as medicinal plants, vegetables and oilseeds
- ⇒ Establish market linkages for
 - Sale of crops by establishing well regulated 'mandis' at centres close to the villages
 - Improving earnings from milk and other dairy products (*through formation of co-operatives*)
 - Selling medicinal plants etc.

Awareness and Capacity Building

- ⇒ On maximizing benefits from the ongoing Government Schemes.
- ⇒ On the best water management practices.
- ⇒ On cultivation and management of locally suited crop varieties.
- ⇒ On the benefits of consumption of a balanced diet including vegetables (*and not just rice, wheat, bajra etc.*)
- ⇒ On need for long term development planning

Recommendation for Central/ State Governments:

Reduce gap between planning and implementation through

- ⇒ Better co-ordination between implementing agencies
- ⇒ Involving communities and NGOs in designing and implementing the programmes
- ⇒ Effective monitoring and evaluation of Government Programmes

Improve rural infrastructure such as roads, communication, cold storages etc.

Redesign a simple, easy to understand and operate scheme for crop insurance.

Focus on preparedness for disaster rather than relief.

Specific case studies to capture regional and local dimensions are required.

For this there is an urgent need of pilot implementation studies. These implementation studies should be at micro (village) - as well as macro (district, state) level. There is a need for linking cross-sectoral impacts study.

For Funding Agencies

- ⇒ Pilot case studies in different geo-climatic conditions, document success stories and disseminate results.

.....

...The prime adaptation challenge facing the country is availability of resources (human, technical and financial) to implement adaptation measures.



