



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

**WORKING PAPER 93**

Drought Series. Paper 6

# State Level Analysis of Drought Policies and Impacts in Rajasthan, India

M. S. Rathore



**Working Paper 93**

Drought Series Paper No. 6

**STATE LEVEL ANALYSIS OF DROUGHT POLICIES AND  
IMPACTS IN RAJASTHAN, INDIA**

*M. S. Rathore*

International Water Management Institute

IWMI receives its principal funding from 58 governments, private foundations and international and regional organizations known as the Consultative Group on International Agricultural Research (CGIAR). Support is also given by the Governments of Ghana, Pakistan, South Africa, Sri Lanka and Thailand.

*The authors:* Dr Manohar Singh Rathore is a Senior Fellow at the Institute of Development Studies, Jaipur, Rajasthan, India

This paper is part of the research project “Drought Assessment and Mitigation Potential in South West Asia,” implemented by IWMI and partner organizations, and sponsored by the US State Department Regional Environment Office for South Asia through agreement with the USAID. This paper is based on a report submitted by IDS to IWMI. The report was modified from its original version and edited by Dr. Vladimir Smakhtin, IWMI, Colombo, Sri Lanka. The paper has been reviewed by Dr Hugh Tural, IWMI, Colombo, Sri Lanka.

The views expressed in the paper remain the responsibility of the author only.

Rathore, M. S. 2005. State level analysis of drought policies and impacts in Rajasthan, India. Colombo, Sri Lanka: IWMI. 40p. (Working paper 93 : Drought Series Paper No. 6)

*drought / analysis / crop production / livestock / agricultural production / social impact / financing / policy / institutions / India*

ISBN 92-9090-593-X

Copyright 2004, by IWMI. All rights reserved.

Please direct inquiries and comments to: [iwmi@cgiar.org](mailto:iwmi@cgiar.org)

## Contents

Introduction .....	1
Droughts in Rajasthan .....	2
Declaring a drought .....	7
Impacts of drought .....	9
Policy of financing drought relief expenditure.....	15
Analysis of State budget and drought relief expenditure .....	18
Institutions for drought management .....	20
State response to drought .....	23
Conclusions .....	26
References .....	29

## Abbreviations and Terms

ARWSP	Accelerated Rural Water Supply Programme
BPL	Below Poverty Line
COD	Committee of Direction
CRF	Calamity Relief Fund
CWWG	Crop Weather Watch Group
DDP	Desert Development Programme
DMC	Disaster Management Centre
DPAP	Drought Prone Area Programme
EGP	Employment Generation Programme
FC	Famine Code
FC	Finance Commission
GOR	Government of Rajasthan
GSDP	Gross Domestic Product
HLC	High Level Committee
IMD	Indian Meteorological Department
IMG	Inter-Ministerial Group
IRDP	Integrated Rural Development Programme
IWDP	Integrated Watershed Development Programme
MHA	Ministry of Home Affairs
MOS	Memorandum of Scarcity
NCCF	National Calamity Contingency Fund
NGO	Non Governmental Organisation
NSDP	Net State Domestic Product
NWDPRA	National Watershed Development Programme for Rainfed Areas
OBC	Other Backward Castes
PHED	Public Health Engineering Department
SC	Scheduled Caste
SDO	Sub Divisional Officer
SFDA	Small Farmer Development Agency
ST	Scheduled Tribe
TADP	Tribal Area Development Programme)
WWG	Weather Watch Group
1 Crore	– 10 Million
1 Lakh	– 0.1 Million
Panchayat	– Village Council to manage all development work in villages
Tehsil	– Administrative unit within a district
Rabi	– Winter crop season
Kharif	– Summer crop season

## **Introduction**

The conventional attitude to a drought as a phenomenon of arid and semi-arid areas is changing because even areas with high average rainfall often face acute water scarcity. Cheerapunji, the world's highest rainfall area, is facing severe drinking water shortages. Drought in the state of Orissa, with an average rainfall of 1100 mm, surprised many. A water scarcity condition in the Himalayan region is also not uncommon. This shows that drought is just not the scarcity or absence of rainfall, but is more related to water resource management (or mismanagement).

In the case of Rajasthan, there have been 48 drought years of varied intensity since 1901. (last 102 years). A more detailed analysis reveals that only in 9 out of 102 years were none of the districts in the State affected by droughts. At the village level, the number of drought-free years will be even less. Therefore, every year some part(s) of Rajasthan is affected by drought. Despite this, the State considers drought as a transient phenomenon where shortterm relief measures are considered to be a solution.

This paper examines the range of drought management issues in the State, intends to identify existing gaps and suggest appropriate measures to reduce the impact of droughts in the future.

The study is carried out as part of the regional project on drought assessment and mitigation in southwest Asia, which focuses on Afghanistan, southern Pakistan and west India. In this larger project, Rajasthan is selected as a primary target area in India. More specifically, the objectives of this particular study are:

- Examine the impact of drought on production, employment, wages and farms income
- Analyze drought relief expenditure and its' impact on the State Budget
- Examine existing drought management policies and institutions in the State
- Examine issues associated with drought declaration

The study is based on secondary data published by various line departments of State and Central Government, review of published research papers and books on the subject and personal interactions of the author with people in rural and urban areas.

The paper is organized in eight chapters, including this Introduction. The second chapter analyses the rainfall pattern and occurrence of drought in different regions of Rajasthan. Problems arising from the definition of a drought, perceptions and response to drought, are also discussed. The next chapter explores the issues of vulnerability to drought and attempts to highlight the need for proper identification of target areas and population for efficient planning of drought relief measures in the state. Present interventions are based more on conventional perceptions, e.g., that Below Poverty Line (BPL) population and population within certain castes are the only vulnerable groups and that the Western region of the State is the most vulnerable. Drought declaration in the State is discussed in the next chapter. The following chapters deal with various impacts of droughts, management of finances and impact of drought on the state budget and State responses and management of droughts. The last chapter summarizes the study findings.

## Droughts in Rajasthan

### Physiography

Rajasthan is the largest State of India (Fig. 1) with an area of 342,000 km<sup>2</sup> (10.4% of the country total) and population of 56.5 million (5% of the country total) of which 76.6% is rural. The state has only 1% of India's water resources (GOI 2004). Administratively, the State is divided into 32 districts and 241 tehsils.

For historical and geographical reasons, the State remains socially and economically backward. Recurrent drought a poor resource base for economic development, the highest cost of development per capita due to aridity and very low density of population, low level of literacy (particularly among women), a very high rate of population growth and scarcity of water make the task of socio-economic development a challenge compared to many other States in the country. The climate of Rajasthan State varies from arid to sub-humid.

*Figure 1 Geographical location and administrative subdivision of the Rajasthan State in 2001.*





Three main physiographic regions can be delineated in the State. To the west of Aravali hills range, there are 11 districts covering approximately 50 % of the area. The climate here is characterized by low and erratic rainfall, extremes of diurnal and annual temperatures, low humidity and high wind velocity. To the east of Aravali, the climate is semi-arid to sub-humid. The 12 districts in this region are characterized by more or less the same extremes in temperatures, relatively lower wind velocity and high humidity with better rainfall. The remaining area falls within the Aravali range with high rainfall, hilly topography and forest cover and is classified as a tribal area.

The average rainfall of Rajasthan is 574 mm but it varies significantly across different regions. In the western Rajasthan, the average annual rainfall ranges from less than 100 mm in north-western part of Jaisalmer (lowest in the state) to over 400 mm in Sikar, Jhunjhunu and Pali regions and along the western fringes of the Aravali range. In the eastern region, the rainfall ranges from 550 mm in Ajmer to 1020 mm in Jhalawar. Mount Abu (Sirohi district) in the southwest, receives the highest rainfall in the state (1638 mm). The annual total spatially averaged rainfall is highly variable and it is most erratic in the western region with frequent dry spells, punctuated occasionally by heavy downpour in some years associated with the passing low pressure systems over the region.

The southwest monsoon, which has its beginning in the last week of June in the eastern parts, may last till mid-September. Pre-monsoon showers begin towards the middle of June and post-monsoon rains occasionally occur in October. In the winter season also, there is sometimes, little rainfall associated with the passing western distribution over the region. At most places, the highest normal monthly rainfall is during July and August. The number of rainy days during this period varies from 10 in Jaisalmer to 40 in Jhalawar and to 48 in Mount Abu. The number of rainfall days during the rest of the year in different parts of Rajasthan range from 2 to 7 (Khan, 1988).

### **Defining a Drought**

Drought results from long continued dry weather and/or insufficiency of rain, which causes exhaustion of soil moisture, depletion of underground water supply and reduction of stream flow. Drought is frequently defined according to disciplinary perspective. Bandyopadhyay (1988) lists four types of droughts, namely (i) meteorological drought, (ii) surface water drought, (iii) ground water drought and (iv) soil-water drought. He argues that the various forms of droughts get generated independently but inseparable and are linked to each other through the water cycle.

The National Commission on Agriculture in India defines three types of droughts, namely, meteorological, agricultural and hydrological droughts. Meteorological drought is defined as a situation when there is significant decrease from normal precipitation over an area (i.e. more than 25 %). Agricultural drought occurs when soil moisture and rainfall are inadequate during the growing season to support healthy crop growth to maturity and causes crop stress and wilting. Hydrological drought may be a result of long term meteorological droughts which result in the drying up of reservoirs, lakes, streams and rivers, and fall in groundwater level.

Many others have also included economic or socio-economic factors. Social drought relates to the impact of drought on human activities, including indirect as well as direct impacts: and Economic drought – “a meteorological anomaly or extreme event of intensity, duration (or both), outside the normal range of events that enterprises and public regulatory bodies have normally taken into account in their economic decisions and that, therefore, results in unanticipated (usually negative), impacts on production and the economy in general” (Benson and Clay, 1998).

The concept of drought varies from place to place depending upon normal climatic conditions, available water resources, agricultural practices and the various socio-economic activities of a region.

The various approaches taken by scientists and non-scientists to define drought demonstrate its complex and interdisciplinary nature. At the same time, although most definitions emphasize the physical aspects of drought, the social aspects are closely related.

### **Drought frequency and intensity**

The dominant impression/perception of droughts and drought prone areas in Rajasthan is quite different than what can be supported by the available facts. It is generally believed that the western arid part has high rainfall variability and is severely affected drought prone region compared to the rest of the Rajasthan, as east and southern parts experience higher rainfall and less variability. On the contrary, the analysis of 102 years of meteorological data shows that standard deviations (SD) of annual rainfall in southern and eastern regions (182 and 207 mm respectively (averaged over all districts of each region) are higher than that of the western region (118 mm).

Various drought indices have been designed to date to allow drought extremity to be examined. Drought Index (DI), used in this study is calculated as follows;

$$DI = (P-X) / SD \quad (1)$$

where P- annual precipitation, X- long term mean and SD- standard deviation. The DI values (and corresponding drought intensity) may be classified into four categories: very severe, severe, moderate and light (DI  $\leq$  -0.1 light drought, DI  $\leq$  - 0.2 moderate drought, DI  $\leq$  - 0.5 severe drought, DI  $\leq$  - 0.8 very severe drought). All drought years in each district have been categorized as above. The results, summarized in Table 1, show that there is not much difference in the total number of drought years between regions. A number of severe and very severe drought years across regions also do not differ much. Over the entire Rajasthan, 48 out of 102 years were drought years, which means that the chance of occurrence of a meteorological drought in the state is 47% (Table 1). The number of severe and very severe drought years is larger in the Western and Southern districts of Rajasthan. This differs from the common perception that southern region with high average rainfall has fewer droughts. The balance of the last column of Table 1 may be attributed to the occurrence of normal and wet years.

Rural people in Rajasthan depend on rainfed agriculture. Coping with low rainfall, with a high coefficient of variation across time and space, is the major challenge. Low fertility of soils, limited rainfall and groundwater availability due to hardrock formations have shaped the farming systems in the regions and determine the levels of adaptability. At the same time, the various components of drought management strategies as well as development strategies were not sensitive to the specifics of the resource base in the State.

### **Vulnerability to drought**

Vulnerability is another important concept to consider in drought impact assessment. It is closely related to food insecurity and can be defined as the probability of an acute decline in food excess or consumption levels below minimum survival needs. In drought years, food insecurity increases due to severe decline in food production / availability, both from individual farms and in the market and because of increased uncertainty of income related to lack of employment opportunities and livelihood. Vulnerability may be assessed in terms of multiple factors/ indicators, which expose people to food insecurity through reduced food availability, access and utilization.

Table 1 Frequency and intensity of droughts in Districts of Rajasthan during 1901-2002

District	Number of years with droughts of different intensity				% of all drought years in the period
	Very Severe	Severe	Moderate	Light	
<b>Western Region</b>	<b>12</b>	<b>12</b>	<b>11</b>	<b>11</b>	<b>45.0</b>
Barmer	4	15	17	11	46.0
Jaisalmer	6	12	13	17	48.0
Bikaner	8	12	16	10	46.0
Sri Ganganagar	9	9	12	18	47.5
Churu	8	11	8	17	43.1
Nagaur	2	17	15	15	48.5
Jodhpur	5	16	16	18	53.9
Pali	7	12	19	14	52.0
Jalore	7	13	13	20	48.1
<b>NE Region</b>	<b>12</b>	<b>8</b>	<b>11</b>	<b>16</b>	<b>46.0</b>
Sikar	5	20	11	14	49.5
Jhunjhunu	9	15	12	12	47.0
Alwar	7	16	10	15	47.0
Jaipur	10	11	16	9	45.5
Ajmer	6	16	21	13	45.5
Tonk	9	11	10	15	45.9
Swai Madhopur	8	8	14	21	50.0
Bharatpur	9	13	11	12	44.5
<b>Southern Region</b>	<b>10</b>	<b>12</b>	<b>9</b>	<b>12</b>	<b>42.1</b>
Bhilwara	3	9	10	14	40.0
Chittorgarh	10	12	9	13	44.0
Udaipur	10	14	14	6	43.5
Sirohi	5	17	10	21	53.0
Banswara	11	14	13	9	44.7
Dungarpur	9	16	10	5	49.5
Bundi	7	16	13	11	44.7
Kota	8	16	11	11	45.5
Jhalawar	8	13	14	8	43.8
<b>All Rajasthan</b>	<b>10</b>	<b>10</b>	<b>15</b>	<b>13</b>	<b>47.0</b>

Note: Based on district wise annual rainfall data

Vulnerability indicators are mostly relative and qualitative, and therefore, difficult to quantify. However, some broad indicators can be listed, including forced migration, borrowings, skipping meals or food shortage, change of occupation, forced unemployment, falling health conditions etc. Vulnerability assessment may be done for different socio-economic groups based on caste, land ownership, primary occupation, income group and gender. They can be assessed at a state, district, village or household level.

Rathore (2004) conducted a vulnerability assessment in Rajasthan and documented vulnerable population in four climatic regions of the State by caste, income and farm size categories. It was shown that both low-income and middle-income households are vulnerable to droughts. In a context of farm sizes, it is marginal and small farmers that are normally most vulnerable, whereas in desert

region, even the large land holders are vulnerable due to the inferior quality of land with no irrigation facilities and direct dependency on erratic rainfall. Landless households are better off as they are less dependent on agriculture and livestock for their livelihood and more mobile.

Identification of vulnerable population, villages and districts are important for policy makers, particularly the Drought Relief Department, for identification of target population. It also helps in stream lining and planning in advance the activists of Relief Department.

### **Drought perceptions and their implications for responses**

In the context of Rajasthan State, the absence of a clear understanding of and agreement on what drought, gives scope for political manipulation. The lack of a precise (and objective) definition of drought in a specific situation is an obstacle to its' understanding, which leads to indecision and/or inaction on the part of policy makers, and others. On the other hand, people do not view drought in a unified way. Their perception of drought is complex and responses often unpredictable. The expected impact of drought and responses are significantly related to both the age and experience of a farmer (Taylor 1987). In order to understand the diversity of coping strategies, it is necessary to explore the social, political and institutional factors that provide contexts for these individual perceptions. Perceptions, however, are not static and may shift over time or are expressed differently under altering circumstances. Thus, perceptions of drought and the associated risks are crucial to formulate appropriate relief and mitigation policies.

Perceptions also shape the responses to drought and the confusion on what drought is may cause difficulties in dealing with the hazard. Some of the difficulties are as follows:

- (i) Drought is perceived as a creeping phenomenon because its' onset and end are often difficult to identify. Clear distinction between non-drought and drought is absent;
- (ii) Drought is generally viewed as a transient phenomenon. As a result, it is usually not taken seriously once the rains have returned; it is considered as a calamity and managed as an event;
- (iii) The direct impacts of drought direct impacts like withering crops, dry watering points, reduced forage for livestock etc., are obvious. Second and third order effects, such as price rise, increased food imports, surges in rural-urban migration rates, are not recognised. As a result, much of the impacts attributable to drought are difficult to identify.

The problem is further compounded by the fact that government perceives drought as a 'crisis situation' and a short term problem and manages it as an isolated event. At the household level, individuals perceive drought as a natural hazard, beyond human control. Both lead to different kinds of approaches and solutions. They also lead to many undesirable consequences. In the long run, defining drought only as a crisis situation or natural phenomenon beyond human control undermines the confidence and capabilities of the people to respond to drought using available resources in a productive manner. They become more and more dependent on the government and expect relief on a larger scale and for a longer time. Social resilience is undermined leading to beliefs that nothing else is possible, that there is really no remedy that will promote self-dependence. In turn, the government becomes complacent and believes that its' actions are in the best interest of the people and that it is doing everything that is expected of a welfare state. Scientists, administrators and politicians also perceive droughts differently but they are not given recognition in State responses to droughts.

## Declaring a Drought

The directives provided in the Famine Code (FC) should, in principle, be the basis for declaration of a drought in Rajasthan. Designated government officials from village level to Tehsil, District, Region, and State level, undertake certain monitoring and reporting activities on a regular basis. At a village level, the Patwari (village revenue record keeper) is responsible for documenting day to day changes in rainfall and crop conditions, fodder and availability of drinking water for human and livestock. He is supposed to provide a detailed record on crop loss at the end of the cropping season. Failure of rains by the end of September is recorded and consolidated at Tehsil level and subsequently sent to Collector and Relief Commissioner. These reports become the basis for drought declaration. There is a list of eq. stepwise actions, an authority responsible for taking action and schedule of responses (GoR, 1988). It is also implicit in the guidelines that a village should be the unit of declaration of a drought. This is particularly important in the conditions of Rajasthan, where spatial and temporal variability of in rainfall is high.

In practice, the FC's guidelines are often violated for various political and administrative reasons and it is the prerogative of the ruling party to decide the time of drought declaration and which village(s) or districts will be declared as drought affected. The financial rules and regulations and availability of funds with the state government also influence the decision. In the past, when mainly a State was responsible for incurring drought relief expenditure, it used to delay the declaration of drought. Under-reporting of drought affected areas and limited relief work were common. This was due to no provision of drought relief expenditure in the annual budget of the state and a fixed proportion of central assistance for drought relief.

After 1995, with the provision of Calamity Relief Fund (established on recommendation of Finance Commission), expenses are shared between state and central government and funds are readily available for undertaking relief work at any point of time. This flexibility has influenced State government decisions in two ways: drought declaration is done much earlier and relief may be applied at a bigger scale (i.e., now a district as a whole is declared as drought affected, as opposed to a village). State and Central Government shares of relief expenditure are 25% and 75% respectively. An early declaration and start of relief work in 2002-2003 was the latest example, very much welcomed by the drought affected population. However, this defies the norms set under the FC and calls for making them more transparent and more in line with the pace of technology, the decision making process and the changing socio-political structure of the society.

Analyzing the government of Rajasthan statement of 2003 that "...this is the 5<sup>th</sup> year in succession of severe drought conditions due to failure of monsoon", Sagar (2003) found that agricultural production, in general, and the foodgrain production, in the preceding year (2001-02) were among the highest ever achieved. Relating the data on agricultural production to the population declared drought affected by the Government of Rajasthan, he observed serious overestimation in drought affected population and the intensity of drought in other years as well. In 2002-03, Banswara district was declared as severely affected. As per the state norms, the district was entitled to initiate relief work at a large scale and relief works begun. Our visit to the area at the time, however, showed that crops in most of the fields were in good condition as people were using groundwater and canal water from Mahi-Bajaj Sagar Dam. Table 2 shows that the intensity of drought reflected in the official figures on districts, and population affected is not always reflected in the corresponding foodgrain outputs.

While preparing a Memorandum of Scarcity (MoS) for claiming funds from the Central Government, there is a tendency to inflate the impact of drought to make a case for larger grants from the Centre. For example, the figures of affected human and livestock population are inflated

No attempt is made to distinguish those actually affected i.e., the vulnerable section of the population. In fact, the segment of the population enjoying a high income, such as the business class, the service class, large farmers, etc. are not affected.

*Table 2 Annual statistics of drought impacts in Rajasthan*

Finance Year	District affected (%)	Human affected (%)	Livestock Population affected (%)	Foodgrain Production Index
1970-71	26.92	1.35	2.28	140.24
1971-72	50	17.3	8.79	100.52
1972-73	100	52.77	47.37	81.84
1973-74	0	0	0	106.65
1974-75	96.15	56.02	NA	78.99
1975-76	0	0	0	12.27
1976-77	0	0	0	118.85
1977-78	73.01	34.54	29.49	113.58
1978-79	100	15.59	41.1	124.12
1979-80	100	86.45	NA	83.26
1980-81	100	59.48	58.39	103.08
1981-82	96.3	64.63	66.76	113.66
1982-83	96.3	60.23	63.14	132.08
1983-84	11.11	0.75	NA	159.87
1984-85	77.78	27.38	26.74	125.58
1985-86	76.3	70.44	61.4	125.88
1986-87	100	82.54	65.96	107.76
1987-88	100	92.27	74.98	76.25
1988-89	62.96	11.44	20.15	170.57
1989-90	92.59	35.35	32.34	135.4
1990-91	0	0	0	173.5
1991-92	100	74.6	66.24	126.64
1992-93	40	10.87	8.89	182.14
1993-94	83	56	54.35	111.94
1994-95	0	0	0	185.81
1995-96	93.55	62.47	59.09	151.81
1996-97	67.74	14.37	15.2	203.44
1997-98	75	11.27	NA	222.67
1998-99	62.5	48.83	54.42	205.23
1999-00	73.64			
2000-01	19.09			
2001-02	96.98			

Source: Government of Rajasthan, Relief Department, Jaipur. Food Grain Production Index: Production of 1971-72 =100

Similarly, where the livestock population is concerned, some distinction has to be made as to which animals are affected by drought—for example, small ruminants (more than 50 % of total livestock population) particularly the goats (around 25 % of the total livestock population) are least affected by drought. Similarly, buffaloes are high-priced animals and only a person who can afford



a steady fodder supply, will keep them. They are, therefore, are unlikely to be affected by drought. On the other hand, cows and sheep are the most affected animals.

The politics of drought declaration are multiplied when the village level allocation of works and budget is decided. Party affiliation becomes the basis for access to relief fund. Manipulations and misinterpretations of rainfall data can make a district non-eligible (or eligible) for drought relief work. All this suggests that the process of drought declaration has effectively become a routine heavily politicized, exercise of bureaucracy, based on “other” considerations. Drought is of course, too complex a situation to be described by a few figures in a table. However, state perception is influenced by these inflated figures with serious consequences for its’ drought mitigation and relief policies. The bureaucracy loses objectivity in keeping the balance between long- term drought mitigation measures and shortterm relief responses. The State is more inclined to undertake continuous ad hoc relief measures than plan and undertake long-term mitigation measures to alleviate future droughts, starting with location- and region-specific economic development programmes. To arrest this trend, it is useful to consider much more indepth analysis of rainfall and other climate variables throughout the State, involve remote sensing technology in assessing the condition of crops and make all drought-related information public, allowing time for people to react before declaration.

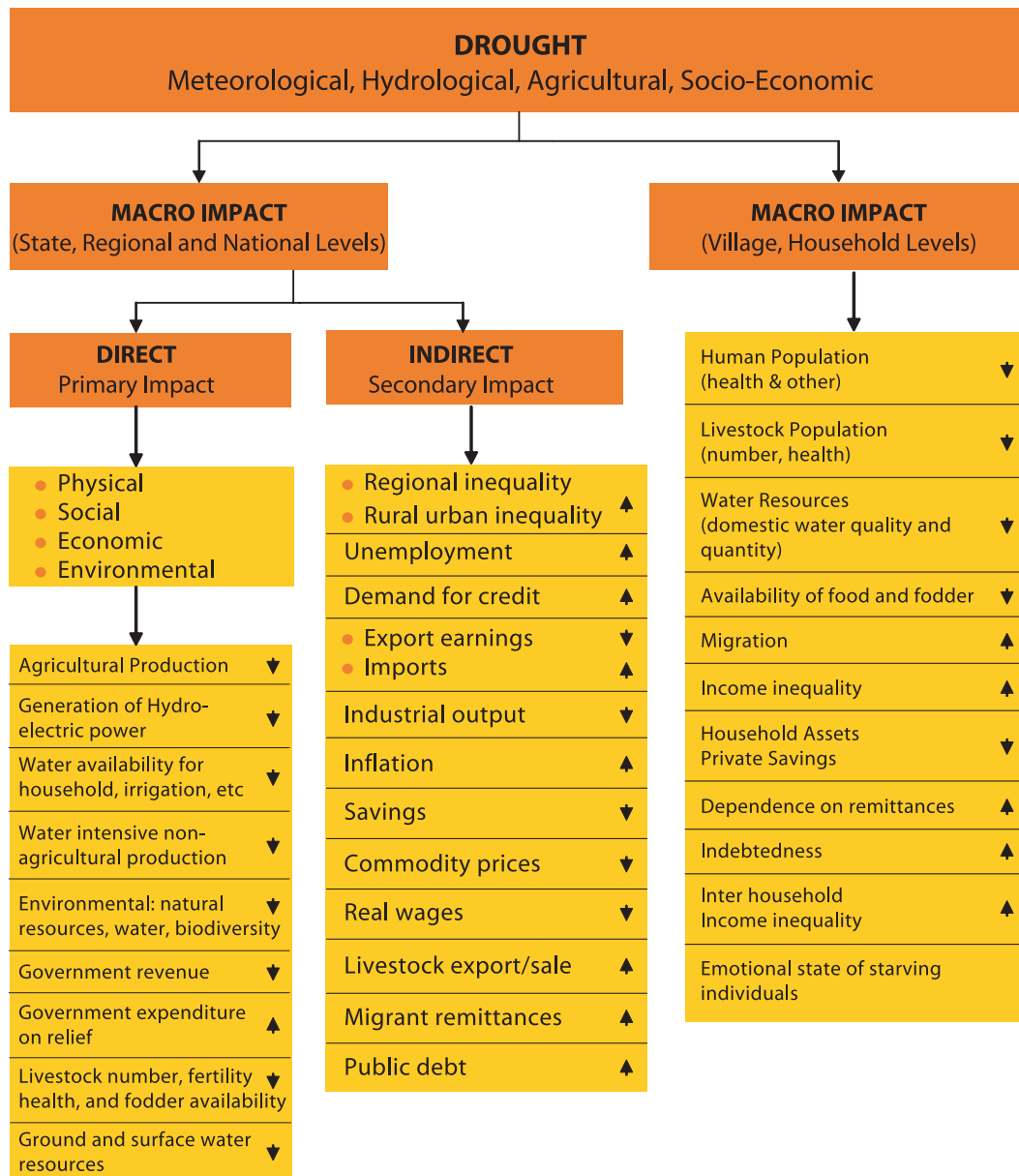
## **Impacts of Drought**

The impact of a drought on the overall economy of the country is evident at macro (State and national level) and micro–levels (village and household levels). The impacts could be direct or indirect and vary in nature and intensity (Fig.2). 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. (Benson and Clay, 1998). Micro-level 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. As water becomes scarce, competition among and within sectors may increase.

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 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.

Figure 2 Different types of drought impact



Increased budgetary pressures, resulting from lower revenues and higher expenditure, can be met by both external and internal borrowings, higher taxes or imposing new taxes. Also, reallocation of planned government expenditure may occur within or among sectors and between capital and recurrent spending with varying opportunity costs.

Droughts have a range of indirect, secondary effects as well. Generally, the secondary impact is on regional inequality, employment, trade deficits, external debt and inflation. The size of agricultural and non-agricultural multipliers plays an important role in determining the second round and subsequent effects of droughts.

The microlevel impacts, at village and household levels, are equally important. Drought can result in a considerable intensification of household food insecurity, water related health risks and loss of livelihoods in the agricultural sector. As discussed above, the agriculture is the first to be



affected by drought. 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.

In this study, we are more concerned with the macrolevel, i.e., State level, direct impact of drought on selected parameters guiding policy makers. These parameters are the number of villages and population affected, livestock, crop damage in terms of area loss and value of crop loss, agricultural employment loss, land revenue loss, extra cost to State in supply of drinking water, loss in hydropower generation, etc. There is no primary survey available to assess the impact of the severe drought in the year 2002-2003. Therefore, the secondary data from published government reports were used. Table 3 provides the summary information on the impact of drought on the parameters listed below for the severe drought year 1988 and the recent four consecutive drought years in Rajasthan. The impact of drought on State Budget is dealt with in the next chapter.

*Table 3 Impact of drought in Rajasthan*

Item	1988	1998	1999	2000	2001	2002
Villages affected	36,252	20,069	23,406	30,583	7,964	40,490
Population affected (million)	31.737	21.507	26.179	33.041	6.97	44.8
Cattle affected (million )	37.23	29.578	34.56	39.969	6.973	45.2
Crop damage						
Area (million ha)	7.436	6.496	7.818	8.947	2.653	11.7
Value (million US \$)	539.1	496.4	740.6	763.4	272.2	959.5
Rainfall deficiency	-45%	-3%	-16%	-29%	-5%	-64%
Hydropower generation deficiency (Million Unit)						
Unit = 1 kilo Wt. Hour	—	—	—	—	—	1280.5
Drinking water supply cost (million US \$)	—	—	—	—	—	110.4
Loss of land revenue (million US \$)						93.3
Loss in agriculture employment (estimated) (million man days)	3.876	3.386	4.075	4.663	1.383	6.098

Source: Government of Rajasthan, Relief Department, Jaipur

### **Impact on agriculture**

Table 4 summarizes some numerical data on drought impacts in Rajasthan. Kharif crops (rainy season) are relatively more affected by drought than Rabi crops (winter season). The higher the intensity of drought, the lower the Kharif crop production. The intensity of drought means the percentage of villages affected by drought in a given year. Rabi crops are mostly irrigated and therefore less affected, as 80% of precipitation takes place in the rainy season, winter rains are limited

Table 4 Impact of drought on economic parameters in Rajasthan

Year	Intensity of drought (percent)	NSDP (million US \$)	Total cropped area (million ha.)	Total agricultural production (million tons)	GSDP (million US \$)	Realwage rate (US \$/ man day)	Price of cow milk (US \$/ Kg)	Kharif production (million tons)	Rabi production (million tons)	Bajra price (US \$/ qtls)	Jowar price (US \$/ qtls)	Maize price (US \$/ qtls)	Wheat price (US \$/ qtls)	Mustard price (US \$/ qtls)	Gram price (US \$/ qtls)
1980	100	-	16.9	8.7	3539.1	0.1	0.0	4.7	4.1	2.9	2.6	2.9	3.4	9.2	6.9
1981	96.3	-	17.4	10.0	3813.3	0.1	0.1	4.7	5.3	3.4	2.7	3.3	3.9	9.0	6.0
1982	96.3	-	18.6	11.2	3902.2	0.1	0.1	5.2	6.1	3.3	3.0	3.1	3.8	7.6	5.7
1983	11.1	-	18.4	13.9	4650.2	0.1	0.1	8.1	5.8	3.1	2.8	2.9	3.9	10.2	6.4
1984	77.8	-	18.9	11.3	4417.6	0.1	0.1	6.2	5.1	3.0	2.9	2.9	4.0	7.7	8.6
1985	76.3	-	17.3	10.7	4466.7	0.1	0.1	3.8	6.9	4.1	3.4	4.1	4.4	9.4	7.9
1986	100	-	18.1	9.8	4907.4	0.1	0.1	4.4	5.4	4.0	3.7	4.2	4.3	14.2	7.8
1987	100	-	17.6	7.2	4698.9	0.1	0.1	2.5	4.8	4.9	4.0	4.5	5.3	14.8	10.6
1988	63.0	-	13.3	14.4	6232.2	0.1	0.1	7.6	6.8	3.2	3.9	4.2	5.7	11.9	12.3
1989	92.9	-	18.8	12.5	6159.8	0.1	0.1	6.7	5.8	3.9	4.1	4.0	5.4	14.7	14.2
1990		3821.2	0.0	13.1	7099.6	0.1	0.1	0.0	0.0	4.7	4.6	4.6	6.8	18.5	13.7
1991	100	4357.4	17.9	16.7	6716.7	0.1	0.2	5.2	7.9	7.9	7.3	7.3	8.4	19.3	13.8
1992	40.0	5205.3	18.1	11.6	7568.5	0.1	0.1	8.6	8.2	6.1	6.1	6.2	7.7	18.7	16.0
1993	83.0	5375.4	20.2	17.1	7167.4	0.1	0.2	5.3	6.3	7.3	6.9	6.1	9.1	22.0	22.9
1994		7176.3	19.3	15.7	8401.7	0.1	0.2	7.6	9.6	7.9	8.3	9.2	8.9	21.1	17.9
1995	93.5	7922.2	20.4	19.7	8744.6	-	0.2	6.2	9.4	9.2	9.6	8.9	9.8	23.2	18.6
1996	67.7	9632.0	19.7	20.1	9729.3	-	0.2	8.8	11.0	9.3	10.2	10.0	12.6	24.6	25.2
1997	75.0	10229.3	20.7	19.0	10830.7	-	0.0	8.7	11.4	8.5	9.8	9.1	11.6	28.9	21.4
1998	62.5	10928.5	22.3	19.3	11156.5	-	0.2	7.0	12.0	9.0	10.7	10.0	10.8	0.0	25.5
1999	73.6	14309.9	21.2	12.8	11497.8	-	0.2	8.3	11.0	12.7	13.6	11.2	14.2	0.0	26.2
2000	19.1	14554.2	20.1	-	11290.7	-	0.3	5.0	7.8	9.3	10.9	11.3	13.7	0.0	35.7
2001	97.0	16347.4	25.9	-	12473.7	-	-	-	-	-	-	-	-	-	-

Source: Statistical Abstract of Rajasthan - 1987 at Page No. 235 – 237 – 238 – 243  
 Statistical Abstract of Rajasthan - 1990-91 at Page No. 348 – 350 – 351 – 356  
 Statistical Abstract of Rajasthan - 1996 at Page No. 303 – 305 – 306 – 311

Note: Quintal/qtls. –100 kilogram  
 Bajra – Pearl Millet, Jowar – Millet, Gram - Chickpea  
 All data were converted from INR to USD and from national system to metric system

and that is mostly in eastern and southern part of Rajasthan. To cope with the rainfall variability, people have adopted mix-farming system. Drought affects Kharif production in varied proportions. Many times, the distribution of rainfall is such that the grain output is severely affected but a lot of fodder is produced to sustain livestock. Therefore, it is difficult to capture these complexities and quantify the impact of drought on crops without systematic micro level detailed study.

Severe droughts are rare but annual dry periods may lead to crop failure as well. It varies according to the time of the first rains, number of rainy days and location. Despite frequent droughts affecting agricultural output, there is an increasing trend in the foodgrain index, primarily due to the increasing area under cultivation.

### **Impact on Livestock**

The Impact of drought on livestock is manifested in four ways; (i) mortality, (ii) loss in productivity, (iii) health of animal, and (iv) loss in fertility. There are two sources of information to verify the impact of drought on livestock. First, the secondary data published by the State Animal Husbandry Department based on the quinquennial livestock census conducted in the state since 1951, and the second, primary survey conducted at IDS after the drought year 2002-03 in the 18 districts on sample households. As the census is conducted every four years irrespective of whether it is a drought or a normal year, it does not capture the true picture of drought impacts on animals. These data may provide some idea about large animals, as they cannot recover fast after drought. But the information is misleading in the case of small ruminants, which multiply fast in between the census years to recover from the impact of drought.

Table 5 provides information on changes in composition of livestock in Rajasthan since 1951. 2003 was, coincidentally, a drought year and the census captures the impact of the severe drought. The last row of the table shows that sheep and camels, followed by cows, were the most vulnerable animals. They perished in large numbers ranging between 10 to 32 % of the population. Our primary surveys have shown (Rathore, 2004) that losses of cows were much higher, compared to state level census data, as large numbers i.e., 25 to 50 % of cows were abandoned due to starvation or put in charity centers, because of acute shortage of fodder and finances. The remaining cows became dry and weak. There was nobody to buy cows even for slaughter, as there is a ban on cow slaughter in Rajasthan. The severity of drought can be judged by the fact that even high price animals like buffaloes suffered and a few perished.

*Table 5 Growth and composition of livestock in Rajasthan (Figures in million)*

Year	Cattle	Buffalo	Sheep	Goat	Camel	Others	Total
1951	10.787 (42.26)	3.045 (11.93)	5.387 (21.11)	5.562 (21.80)	0.341 (1.34)	0.399 (1.56)	25.5 (100)
1961	13.136 (39.20)	4.019 (11.99)	7.361 (21.97)	8.052 (24.03)	0.570 (1.70)	0.371 (1.11)	33.5 (100)
1972	12.470 (32.07)	4.593 (11.81)	8.556 (22.01)	12.162 (31.28)	0.745 (1.92)	0.353 (0.90)	38.9 (100)
1977	12.896 (31.18)	5.072 (12.26)	9.938 (24.03)	12.307 (29.76)	0.752 (1.82)	0.394 (0.95)	41.3 (100)
1983	13.504 (27.20)	6.043 (12.17)	13.431 (27.05)	15.480 (31.18)	0.756 (1.52)	0.436 (0.88)	49.6 (100)
1988	10.916 (26.69)	6.340 (15.60)	9.913 (24.24)	12.593 (30.79)	0.721 (1.76)	0.418 (1.02)	40.9 (100)
1992	11.639 (24.0)	7.765 (6.0)	12.497 (25.08)	15.352 (31.77)	0.744 (1.5)	0.454 (0.9)	48.5 (100)
1997	12.159 (22.4)	9.756 (18.0)	14.312 (26.3)	16.937 (31.2)	0.668 (1.2)	0.490 (0.9)	54.3 (100)
2003	10.871 (22.2)	10.511 (21.5)	9.759 (19.9)	16.774 (34.3)	0.497 (1.0)	0.480 (0.10)	48.9 (100)
% change 1997-03	-10.59	7.74	-31.81	-0.96	-25.60		-9.99

Source: Government of Rajasthan, Department of Animal Husbandry, Jaipur

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. Moving to better-endowed areas saves them. Migration of small animals is traditional practice in Rajasthan. 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 die (10% of the total number, as reported by people). The drought year 2002-03 was bad for sheep as there was widespread drought in Rajasthan and also in adjoining States, therefore even the migration strategy did not work and more than 32% of sheep perished.

Other economic indicators to capture the impact of drought on livestock are price of animal and animal products. Some existing data (Directorate of Agriculture, 1999; Directorate of Economics and Statistics 2001, 2002) show that prices of livestock products are usually increasing, irrespective of a drought. There are other factors increasing demand for livestock products, e.g., ever-increasing human population and export of livestock products to neighboring States. One has to examine secondary impacts of droughts by separating factors, such as, increase in fodder and feed prices contributing to changing economics of livestock rearing in the State.

## **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. Health impacts must also be mentioned. Fortunately, the drought of 2002-03 was best managed by the State in terms of food for work. A large part of the affected population received food and cash from relief programmes and consequently, no impact on health was reported. Rathore (2004) reports change in occupation and migration due to drought. 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. It is acknowledged that relief work by the State government in the entire drought affected districts largely contained the human out-migration from the State.

The change in real wages since 1980 is reported in Table 4. There seems to be no relation between wages and drought, perhaps because the State has enforced a Minimum Wage Act. Because of a loss in agricultural employment, people were forced to migrate in search of jobs within and outside the State and consequently, wages did not fall officially. In practice, people do work on lower wages in distress, mostly in urban areas and this fact does not appear in the statistics. Single persons and even whole families become bonded or contract labour for short periods of 3 to 6 months until the next monsoon season. This hardship faced by poor people is the direct impact of drought. Presently the problem is addressed by the State through starting relief work.

Loss in agricultural employment varies according to the intensity of drought. Employment loss was calculated by estimating the decline / deviation in area under cultivation from normal year figures and multiplying it by the average labour hours required for raising crops in Rajasthan. The cost of Production Scheme in Rajasthan provides data on human labour use per crop. This information was used to calculate the annual loss in agricultural employment and is reported in Table 3. It shows that loss varies according to the intensity of drought represented in terms of rainfall deficiency. Year 2002-03 experienced severe drought with rainfall deficiency of 64% and the employment loss estimated is almost 61 crore human days.

## **Policy of Financing Relief Expenditure**

### **The History of Finance Commissions**

The post Independence history of financing relief expenditure is the history of awards of the Finance Commissions, appointed under Article 280 of the Constitution of India every five years. Finance Commissions have a mandate, amongst the others, to assess the financial needs (mainly non-developmental) of the States, and to determine various grants payable to the States. The ToR of Finance Commission require it, inter-alia, to make recommendations of how the Central Government might assist States in financing relief expenditure. In the earlier phases, the role of the Commission was restricted to suggesting the pattern of financial assistance by the Centre. Subsequently, the recommendations extended to cover the “scheme of financing relief expenditure”. There was a recognition that although the responsibility of dealing with natural calamities rested primarily with

the States, providing financial support for this responsibility substantially depends on the Centre. The First Finance Commission (1952) provided for Central assistance equivalent to 50% of requirements for relief employment works. This was provided in the form of loans and a grant (not exceeding Rs. 2 crores per State per annum) for gratuitous relief to the destitute. Room for further assistance was kept open by having a system of advances to States which needed to tackle severe natural calamities.

The Fourth Finance Commission introduced a system of Central Team visits to States in cases where Relief Expenditure on a particular calamity was likely to exceed Rs. 1 crore. Emphasis was placed on meeting relief expenditure, as far as possible, within the Plan allocations. In any case, the Central Government was expected to meet only half of the expenditure assessed by the Central Teams.

Most States in India are under severe fiscal strain. Hence, a need was felt to make available to States some recurring funds to meet the immediate requirements of relief in “less severe” calamities. This became known as a “margin money” concept. Each State was sanctioned a certain amount based on its past average expenditure on relief. Amounts in excess of margin money (in the event of severe calamity) were to be determined by Central Teams. All efforts were to be made to meet the additional expenditure, in the first instance, from Plan allocations of the State concerned. Additional Central assistance was envisaged only where the relief requirements of a severe calamity could not be thus made.

The “margin money” concept was extended by the Ninth Finance Commission (1991) through the Calamity Relief Fund (CRF). The CRF envisaged contributions of Central and State Governments in the ratio of 3:1. The Fund was to be kept outside the Government Account so that cash flow difficulties did not come in the way of initiating relief operations. The contributions of the Central and State Governments are to be credited twice a year in May and November. The power to operate the fund resides with a committee headed by the Chief Secretary of the State.

The CRF concept was not fundamentally different from the margin money approach, but it prescribed a larger contribution by the Central Government. The fundamental shift was the introduction (along with the CRF) of the ‘normative approach’ to relief expenditure. This approach envisaged expenditure from CRF on predetermined items (norms) at predetermined scales. This system is still in force despite some procedural changes laid down by subsequent Finance Commissions. For calamities of a severe nature, where relief expenditure can not be accommodated within the balances available in the CRF, a National Calamity Contingency Fund (NCCF) was constituted by Eleventh Finance Commission. The NCCF was created in 2001.

### **Procedures for sanctioning central assistance**

There are three steps involved in sanctioning Central assistance. The first step is a declaration of drought by the State Government. Second is the preparation of Memorandum of Scarcity. Third is the constitution of the committee by the Central Government—to verify the occurrence and intensity of drought. The first and second steps are implemented by the drought affected State, while the third step is undertaken by the Central Government. The contribution of the State and Central Governments to the drought relief fund is reported in Table 6. What is noteworthy from the Table is the dominance of the Central Government in the whole process of decision making as they part with major share. Hence, alliances between the political party in power at the Centre and their State counterparts play a major role in the declaration of drought and sanction / approval from National Government. It becomes more complicated when a State also demands foodgrain as part of wages to be paid for relief work as, again, the stocks of foodgrain are owned by National Government. Quantum and timely release of foodgrain becomes a big political issue.

A team is constituted by the Central Government (Department of Agriculture & Cooperation in the Ministry of Agriculture for droughts and the Ministry of Home Affairs, in case of other natural calamities) assesses the situation on the ground and interacts with the higher echelons of the State Government concerned. It also formulates recommendations for assistance. These recommendations are scrutinized by an Inter-Ministerial Group (IMG) headed by the Agriculture Secretary, in case of droughts, and by the Home Secretary, for other calamities. The IMG looks into what norms and scales of expenditure are common in case of both CRF and NCCF. The results of the scrutiny by the IMG are placed for a decision of a High Level Committee (HLC). HLC is chaired by the Deputy Prime Minister, with Union Ministers of Agriculture and Finance along with the Deputy Chairman Planning Commission, as Members. The Ministry of Home Affairs (MHA) services the HLC. The assistance to be released from the NCCF is determined after deducting balances available in the CRF of the State, as determined by the MHA.

*Table 6 Source of drought relief funds in Rajasthan (million US \$)*

Year	Amount Received for Relief				Total	Actual Expenditure on Drought Relief
	Central Government	State Government	National Calamity Relief Fund	Others		
1980-81	10.44	-	-	-	10.44	7.24
1981-82	20.78	-	-	-	20.78	23.73
1982-83	17.84	-	-	-	17.84	21.99
1983-84	10.38	-	-	-	10.38	14.80
1984-85	2.86	-	-	-	2.86	1.37
1985-86	23.59	-	-	-	23.59	19.85
1986-87	34.39	-	-	-	34.39	35.35
1987-88	97.72	-	-	-	97.72	135.28
1988-89	54.39	-	-	-	54.39	70.17
1989-90	10.56	-	-	-	10.56	6.67
11-th Finance Commission						
1990-91	20.22	6.74	-	0.00	26.96	8.35
1991-92	20.22	6.74	-	2.15	29.10	1.25
1992-93	20.22	6.74	-	4.24	31.20	28.52
1993-94	20.22	6.74	-	4.64	31.60	7.44
1994-95	20.22	6.74	-	2.69	29.65	36.22
12-th Finance Commission						
1995-96	27.55	9.18	-	1.02	37.76	9.93
1996-97	29.19	9.73	4.57	1.23	44.72	44.25
1997-98	30.80	10.27	0.00	1.63	42.70	1.13
1998-99	32.37	10.79	0.00	4.45	47.62	40.72
1999-00	33.75	11.25	4.78	3.23	53.01	59.45
2000-01	42.61	14.20	40.85	0.15	97.81	110.46
2001-02	26.58	8.86	17.17	0.11	52.71	70.02
2002-03	46.98	15.66	37.99	0.00	100.62	94.23
2003-04	29.30	9.77	167.84	0.76	207.68	180.60



## Analysis of State budget and drought relief expenditure

The analysis of a State Budget provides information about the health of the State economy. How the revenue is raised, where the expenditure is made, budget deficit and public debt are some relevant items to consider. A brief look at the Gross State Domestic Product (GSDP) indicates that the share of agriculture and allied services, in total, declined from 43.8% in 1980-81 to 29.5% in 2001-02. On the plan expenditure side, the Irrigation Sector received the major share of expenditure in the State, due to large investments in irrigation structures in the past. This gradually came down to less than 10% in the year 2000-01 (Table 7). This is mainly because of exhaustion of major economic sites for construction of surface water structures and changes in policy to emphasis on utilization of potential created and improvement of efficiency in water utilization and management. Investments in irrigation structures were mainly for drought proofing, i.e., to stabilize agriculture production and reduce uncertainty in rainfall by expansion of irrigated agriculture in the State. Such investments have substantially decreased with time, which may be seen as the indication of the reduction of financing the longterm drought preparedness projects. At the same time, private investment in pumps to lift ground water also increased and today there is a serious crisis of groundwater over exploitation.

*Table 7 The shares of relevant sectors in the budget of Rajasthan (%)*

Fiscal Year	Agriculture & Allied service	Irrigation & Flood control	Rural Development
1951-56	5.02	46.25	4.84
1956-61	6.36	28.08	6.91
1961-66	6.91	39.28	7.54
1966-69	8.30	29.87	3.16
1969-74	3.58	33.58	1.04
1974-79	3.88	32.63	2.13
1979—80	4.61	29.55	3.38
1980-85	4.07	26.67	5.54
1985-90	4.82	22.70	4.85
1990-91	7.33	19.11	6.03
1991-92	7.04	19.95	6.48
1992-97	10.15	16.70	9.62
1997-98	8.46	14.74	9.07
1998-99	7.07	13.81	8.17
1999-2000	6.68	13.64	6.90
2000-01	4.00	9.03	8.75
2001-02	2.65	8.59	10.78

Source: (1) Fifty years of Agricultural Development in Rajasthan Statistical section, Directorate of Agriculture, Pant Krishi Bhawan, Jaipur.(1999) Page 285

(2) Basic statistics Rajasthan 2001 Directorate of Economics & Statistics, Rajasthan, Jaipur Page179-185

(3) Basic statistics Rajasthan 2002 Directorate of Economics & Statistics, Rajasthan, Jaipur Page182-187



Total State debt and per capita debt is increasing over years (Directorate of Agriculture 1999; Fifty years of Agricultural Development in Rajasthan 2002). The per capita debt is growing at a very fast rate over the last 7 years i.e., from 1997-98 to 2003-04, it increased from USD 80.7 to USD 197 per person—an increase at a growth rate of 16.1% per annum. It reflects the poor financial conditions of the State Government. This gets further aggravated in a drought, as most of the economic activities are affected by it. State revenues particularly from Agricultural and Allied activities and related secondary and territory sectors, are negatively affected. There is an extra burden on the State Budget because of drought relief and drought mitigation programmes.

Table 8 shows annual rainfall, intensity of drought and expenditure on drought relief in Rajasthan since 1980-81. The amount varies according to intensity of drought; for example, in the most severe drought year 1987-88, the State made an expenditure of Rs. 622.31 crores (about 135 m USD) on drought relief. This amount has significantly increased in the last severe drought year 2002-03 and will be close to 200 m USD. Fortunately, there is a provision for sharing this relief expenditure between State and Central Government, as per the norms decided by national finance commission appointed every fourth year. Otherwise it would have been extremely difficult to support this amount with State funds. Also, it would have cost the State a reduction in planned development expenditure, adding further stress to State finances.

*Table 8 Intensity of drought and expenditure on drought relief in Rajasthan*

Year	Intensity of drought (%)	Expenditure on drought relief (Mill US \$)	Annual rainfall(mm)
1980-81	100	7.24	423.9
1981-82	96.3	23.73	562.1
1982-83	96.3	21.99	557.8
1983-84	11.1	14.80	620.3
1984-85	77.8	1.37	473.5
1985-86	76.3	19.85	502.8
1986-87	100	35.35	464.0
1987-88	100	135.28	314.5
1988-89	63.0	70.17	534.1
1989-90	92.6	6.67	455.0
1990-91	0	8.35	727.3
1991-92	100	1.25	492.7
1992-93	40.0	28.52	649.5
1993-94	83.0	7.44	536.7
1994-95	0	36.22	688.2
1995-96	93.5	9.93	620.5
1996-97	67.7	44.25	757.2
1997-98	75.0	1.13	690.5
1998-99	62.5	40.72	589.4
1999-2000	73.6	59.45	506.5
2000-2001	19.1	110.46	416.4
2001-2002	97.0	70.02	574.3

The Annual Budget documents of the Finance Department, Government of Rajasthan, provide item wise expenditure on drought relief (Table 9). The major proportion of relief grant is used to create wage employment in the drought affected villages. As discussed above, livestock being an important asset and equally affected by drought, the State also arranges fodder for cattle, incurring the heavy expenditure on transportation and purchase of fodder. During the last drought year, special effort was made to address the malnutrition and hunger of children in the State. A Supplementary Nutrition programme was initiated at the cost of Rs. 30 crores (about 6.52 m USD). Gratuitous relief has also increased to address old, disabled and marginalized sections of the population. Tanker supply of water is also an important item of expenditure. The higher the intensity of drought, the more the expenditure on drinking water in the State.

*Table 9 Item wise expenditure on drought relief works in Rajasthan (Million US \$)*

Items	1999-2000 AE	2000-01 AE	2001-02 AE	2002-03 AE	2003-04 BE	2003-0 RE	2004-05 BE
Gratuitous Relief	0.00	0.62	0.41	3.81	0.65	1.40	0.43
Drinking Water	0.18	0.24	0.43	0.39	0.71	2.05	0.49
Supplementary Nutrition	0.00	0.00	0.00	0.00	0.00	6.52	0.00
Fodder Supply	0.41	4.75	3.61	34.70	11.20	45.83	2.72
Animal Health	0.00	0.00	0.00	0.55	1.09	0.25	0.43
Public Health	0.00	0.62	0.00	4.52	0.00	7.61	0.00
Other Wages Expenditure	58.85	104.24	65.77	50.55	25.42	131.14	50.61
Total	59.45	110.46	70.22	94.53	39.07	194.80	54.69

Actual Expenditure(AE); Budget Estimate(BE); Revised Estimate(RE)

## **Institutions for Drought Management**

### **Organisational Structure**

Effective management of drought depends on the State infrastructure, governance and the instruments, such as, organisational structure, laws, regulations and policies, directly or indirectly related to management of drought. In the existing structure of State Government, there is a Drought Relief Department and other allied departments with relevant programmes and policies. The Relief Department is directly responsible for taking measures during a drought in order to reduce its' impacts, particularly on the rural poor. The activities of the Department are largely governed by the "Famine Code" guidelines and the national and State government agreements regarding sharing of funds for the purpose.

There is a well-laid organisational structure from state to village level for management of drought in the State. The constituted committees, taskforces and specifically nominated officers to deal with drought, are fully supported by the existing government structure at all levels. Role, specific tasks and accountability of government functionaries are listed in the FC and briefly summarized below.

## **Committee of Directions**

At the apex level, there is a Committee of Directions—the highest decision making body for drought related measures comprising the Chief Minister, 9 Cabinet Ministers, Chief Secretary and the Relief Secretary. On average the Committee meets twice a month during a drought period.

## **Task Forces**

Five Task Forces were set up to closely monitor the various drought relief activities:

- On Relief works, headed by the Chief Secretary
- On Drinking Water, headed by the Chief Secretary
- On Nutrition and Health, headed by Additional Chief Secretary and Development Commissioner
- On Energy, headed by the CMD, Rajasthan Vidyut Vitaran Nigam Ltd

These Task Forces met regularly on a fortnightly basis during the drought period.

## **District and Sub Divisional Relief Committees**

At the district level, there is a District Relief Committee, headed by the Minister in Charge of the district and co-chaired by the Collector of the district. The Committee comprises of both officials and non-officials, including local Members of Parliament, Legislative Assembly and representatives of Panchayati Raj Institutions. Representatives of NGOs and social workers are also co-opted as members on this committee. This committee sanctions relief measures and closely monitors the implementation.

At the Block level, there is a committee comprising of both officials and non-officials, headed by the sub-Divisional Officer. This is followed by a Committee at the village Panchayat Level, headed by the Sarpanch of the Panchayat.

## **Functional Hierarchy**

At the functional / operational level, the hierarchy extends from the Relief Commissioner, Divisional Commissioner, Collector of the district, Sub Divisional Officer, to the Tehsildar and other Revenue staff, with other departments contributing on needs basis.

At the district level, the Collector plays a pivotal role in the implementation and co-ordination of relief activities with the support of district level officers of other departments and the Revenue Officers. By a special order, the State Government empowered the Collectors to take disciplinary action against officers of other departments for dereliction of duty regarding relief operations. Thus, the entire district machinery is placed under the effective control of the Collector during the relief operations. For each district, a Minister-in-charge is appointed to direct, supervise the review relief activities and assist the district administration in problem solving. The Minister-in-charge is also required to submit a report as per the prescribed checklist to the Chief Minister.

The State Government also made one Secretary to the State Government incharge of a drought/ disaster affected district, who is expected to visit the district under his charge once a fortnight and submit a report in the prescribed format covering all aspects of drought. For each village, a Village Level functionary is in charge of drought relief activities and has to report to the block control room, if there is any deficiency or difficulty in relief measures.

### **Control Rooms**

Control rooms managed by senior officials are set up at State, District and Block levels, which continuously function during the drought period. Control Rooms are responsible for collating periodical information on various relief activities from the field. The approach is to detect early signals of any emerging distress and initiate timely action to avert any crisis.

### **Drought monitoring and early warning**

The India Meteorological Department (IMD), with the help of the Ministerial Crop Weather Watch Group (CWWG), carries out a drought forecasting function at the national level. At the State level, Rajasthan has set up a Weather Watch Group (WWG) under the Chairmanship of the Relief Secretary having Director Agriculture, Director IMD, Hydrologist Irrigation Department and representative of PHED and Ground Water Department as members. This Group meets every Monday during the Monsoon season to monitor agro climatic parameters and help to provide early warning of drought onset. The data may, however, not be available for public use for months. The parameters that are systematically monitored by the Group include:

- **Rainfall Data:** Tehsilwise rainfall data is received on a daily basis in the Relief Department from the District Collector, as well as the Hydrologist of the Irrigation Department. Each Tehsil Headquarters is provided with a raingauge and the system of rainfall recording and reporting is laid down in the Land Revenue (Land Records) Rules 1957. The data is analysed daily and the Tehsils having deficient/scanty rainfall compared to the normal, are identified and conveyed to Director Agriculture to take crop contingency measures. This data is discussed in detail in the Weather Watch Group every week and responses of various departments are also decided. The IMD and Irrigation Department of the State also issue fortnightly rainfall reports.
- **Water Levels in Reservoirs:** The Irrigation Department monitors the water levels in all medium and major reservoirs on a daily basis. The total quantity of water available in each reservoir and water inflow during last 24 hours are also monitored.
- **Crop Prospectus:** The Land Revenue (Land Records) Rules of 1957 prescribe a detailed system of rainfall measurement, weekly assessment of crop condition, assessment at village level and transmission of data to the Revenue Board and the Relief Department. The Directorate of Agriculture also has a system to monitor the sowing of crops, crop types, progress of agricultural operations and condition of crops. This information is discussed at the meeting of the WWG to assess the developing situation.

In addition to the above, there is an institution setup on the initiative of the Central Government in each State called Disaster Management Centre (DMC). The Centre is supposed to guide respective State governments in formulation of policies, disaster management plans (State and district level), organize training programmes, etc. In Rajasthan, the DMC claims that they have prepared district wise and state level disaster management plans. However, on review of those, it was found that they are just a standardized set of recommendations and do not reveal a specific understanding of the local problems and their mitigation.

## **State Response to Drought**

### **Rural Development Programmes**

Since Independence, a large number of Rural Development Programmes (RDP), such as infrastructure development (roads, communication, 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 have significantly helped the population in drought prone areas. RDPs 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)
- Rural Poverty Alleviation Programmes, including Individual Beneficiary Programmes, Rural Infrastructure Development, Tribal Area Development, Drinking Water Supply programs etc

Most initiatives, while undoubtedly useful, could have been more efficient if they recognize the resource specifics in drought prone areas and relate them to the age-old adaptations and coping strategies of the people. Similarly, generalized institutional programmes—like land reforms, community development, projects, panchayat systems etc.—were 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.

Undoubtedly, the State has made steady progress in poverty reduction. From 1987 onwards, there is a change in the structure of the economy, i.e., the share of the primary sector in net State Domestic Product has gradually declined from 34.5% in 1987-88 to 32.8% in 2001-2002. 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 laborers, small and marginal farmers still require government support for provision of employment, fodder, drinking water etc.

### **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. Radhakrishnan and Subbarao (1997) argues that the 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. On the contrary, Sagar (2003) argues that PDS has proved to be the cornerstone of food security in Rajasthan, because FPS in rural Rajasthan account for over 76 % of the total 18,943 outlets in the State.

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 foodgrain through its' outlets all over India (Jharwal, 1999). The network is available for drought relief work and is effective in distribution of essential commodities to drought affected population.

### **Food Assistance Programmes**

Both Central and State Governments have initiated many meaningful 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 foodgrains per child per month for school children in classes between I and V, provision of two bags of wheat kept with village Sarpanch 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 laborers, 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 behavioral patterns of those affected by it. Children are the first affected by this distress, as they are forced to join the labour force (Mathur and Jayal, 2003). 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 neighboring States together to provide fodder at lower cost and stock it in areas where it is most needed.

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 (Rathore, 2003a).



## Conclusions

Every year some parts of Rajasthan are affected by drought. But the State has failed so far to diagnose the drought phenomenon and to come up with a longterm solution. Presently, relief is considered to be the panacea for droughts. The main issues emerging for policy formulation and action are: (i) understanding the nature of drought, (ii) modifying perception and response to drought, and (iii) changing the approach from relief to mitigation of drought.

The other significant issue in drought mitigation and relief policy is identification of vulnerable areas and population. The present policies and programs bypass some of the most deserving and vulnerable areas and people. There is a need for transparent and non-political criterion for identification of vulnerable areas and population. This will help target development programmes and drought relief to most deserving population and areas.

Declaration of drought is a sensitive issue. In the study, the politics of drought declaration was discussed. The nature of drought is such that it does not occur in the same intensity across the state and also has differential impacts. Unless this complexity is understood drought declaration will always be a controversial and not transparent. The issues involved are: changing the criteria and process of drought declaration, area to be declared as drought affected, and period for which it is declared. The issue is further complicated by the source and amount of funding required after drought declaration. As a large population and area is affected by drought, a large amount is needed for drought relief work, which the State alone cannot support. Also, in the present political system, both State and Central governments are responsible for dealing with natural calamities. In addition, there have been different political parties ruling at State and Centre level with conflicting political agendas. Competition for votes in their respective constituencies affects drought mitigation and relief policies. At the State level, drought declaration is guided by the age-old Famine Code and political considerations. At Central government level, financing of relief work has undergone several positive changes, guided by the Finance Commission, but some element of politics always remains in releasing the allotted funds. Current policy should ensure sufficient funds are always available with a State to deal with drought of any intensity. What is required is efficiency at State level by formulating appropriate policies programmes and processes for addressing drought, keeping in mind the existing coping strategies of rural population and status of the State's natural resources.

The impact of drought is both direct and indirect on most of the economic and social parameters. Direct impacts are easy to identify and quantify, provided there is a system to address the issue seriously. Present data generation agencies and institutions are not sensitive to recurring drought in the State. There is a need for consistent collection of data on livestock mortality, human migration, coping strategies, depletion of groundwater table, etc. These data are generally collected but no attempts are made to single out the drought impacts from other effects. The first attempt has been made in this study to measure, albeit in a preliminary manner, the impact of drought on agriculture production, livestock, employment, wages, water, etc. What is evident from the study is that impact varies according to the intensity of drought, status of natural resources and economic strength of the people, built by past State development interventions.

Drought impact on food production in the State is negative. The number of vulnerable households is increasing and more people migrate. To stop them, more expenditure on relief work is incurred. Prices of foodgrain and wages are least affected by drought mainly because of the State and Central government economic policies of supporting prices.

The impact of drought on livestock is significant, but the State is less sensitive to this source of livelihood. Pastoralism is marginalized because the State does not consider it as a coping mechanism with the given natural resources and climatic risk. The present policy is to settle nomadic



pastoralists. Further, the State's environmental framework considers this age-old activity to be damaging to the environment. What has changed today is the balance between human, land, forest, water and animals. There is a need to deeply internalize this change before making any NRM policies.

Water is the key to all kinds of vegetative growth. To cope with drought, people have over-exploited groundwater mainly for food production and the situation is aggravating further, as rainfall across the State is insufficient to recharge the falling groundwater levels. Strategies to deal with natural drought may be known, but there is little experience in dealing with "human-made" drought—overexploitation of water resources. The State has a serious role to play in rectifying these conditions.

The impact of drought is ultimately on the livelihoods of people in terms of reduced food availability, forced migration, depletion of fixed and movable assets, health and nutrition and social marginalization. Vulnerability will depend on the economic status of the household. Poverty studies can contribute to quantifying the extent of vulnerable population in the State. As the poor will be the most affected, there is a controversy in poverty statistics because of changes in definition and methods of estimation. We have deliberately avoided using poverty estimates in this study, but it is hardly disputable that recurring droughts are, to a great extent, responsible for keeping the State in the list of Poor States in the country.

The present policy of financing relief expenditure, guided by the recommendations of the Finance Commission, seems to be a pragmatic and efficient in dealing with any kind of natural calamity. What is needed is minimizing the political element and also curb the tendency of State government to always look to the centre, rather than take long term measures to mitigate drought.

The impact of drought on the State budget is discussed in two parts; first the State's overall economic condition in terms of sector-wise growth in State Domestic Product and relation with intensity of drought, and second, expenditure on drought relief and items / sectors. It is evident that the contribution of the agriculture sector has declined over the years and the share of industry, mining, etc., i.e. non-farm sectors, is increasing. The farm sector is more affected by drought and as the economy's dependence on non-farm sector is increasing, the overall impact of drought is less felt. However, still more than 80% of the population is dependent on agriculture, therefore most people are affected by droughts. There is a need to reduce people's dependence on agriculture by diversification of occupation by creating more non-farm employment opportunities commensurate with the capabilities of the people.

Budget deficit and public debt in the State are increasing. Most of the development programmes are externally funded. Relief expenditure analysis shows that it has increased many times mainly because of increased coverage of affected area and population. The itemwise details on relief expenditure show that expenditure on wage employment (relief work in affected villages), is the major share and it varies each year based depending on intensity of drought. Fodder supply, tanker based water supply and gratuitous relief expenditure are the other main items. Meeting drinking water needs of rural and urban population is going to be the major issue in the coming years, as the present practices are likely to be unsustainable.

Finally, efficient management of drought will depend on the organisational structure and policies of the State. There is a well-structured organisational structure to deal with drought, with involvement of politicians and bureaucrats, but no place for civil society and people in policy making or planning of drought mitigation. In the past few years, civil society has taken up a more proactive role and the results were encouraging in terms of reduction in corruption in relief work and extending the period of relief work. The present policy of the State to deal with drought is of a 'reactive' (post-facto) action, rather than 'pro-active', by framing a long term drought mitigation policy, perhaps within a system of larger-scope, arid land management policies. There is need for continuity in the

thinking about drought and drought policy, so that even a non-drought year can be used for undertaking mitigation measures.

Drought monitoring and management require more use of technology in advance prediction, monthly status of crop condition, health of water bodies, etc. The information so generated should also be made public for people's education, and accordingly devising coping strategies.

Initiation of rural development and poverty reduction programmes as a strategy to mitigate drought or reduce the impact of drought did work partially, but needs to be revised in the context of depleting natural resources. Poverty is multidimensional, therefore poverty reduction efforts have to be multi-targeted. Creating long term employment opportunities for the rural poor in such a drought prone State as Rajasthan, should be the future strategy.

## References

- Bandyopadhyay, J. 1988. Water Scarcity: By Choice. *Seminar*. 346: 24-27.
- Benson, C.; and Clay, E. 1998. *The Impact of Drought on Sub-Saharan African Economies: A Preliminary Examination*. Technical paper No.401. Washington, D.C.: World Bank.
- Directorate of Agriculture. 1999. *Fifty years of Agricultural Development in Rajasthan Statistical section*. Jaipur: Pant Krishi Bhawan.
- Directorate of Economics and Statistics. 2001. *Basic statistics—Rajasthan*. Jaipur.
- Directorate of Economics and Statistics. 2002. *Basic statistics—Rajasthan*. Jaipur.
- Food and Agricultural Organisation. 1988. *Sustainable Development in Famine—Drought-Prone Areas: Approaches and Issues*. Rome: FAO.
- Government of India. 1995. *Evaluation report on Revamped Public Distribution System—1993-94, Programme Evaluation Organisation*. New Delhi: GOI.
- Government of India. 2004. *Drought-2002*. New Delhi: Department of Agriculture and Cooperation, Ministry of Agriculture.
- Government of India. 1989. *The drought of 1987: Responses and Management*. Vol. I & II. New Delhi: Ministry of Agriculture.
- Government of India. 1985. *A Model Manual for Drought Management Ministry of Agriculture*. New Delhi:GOI.
- Government of India. Planning Commission. 1980. *Evaluation of Food for Work Programme*. August-October, 1979.
- Government of Rajasthan. Relief Department. 1988. *Memorandum on Scarcity and Additional Requirement to July 1988*.
- Government of Rajasthan. *Drought Prone Area Programme: Draft Annual Plan 1983-84 and 1984-85 Rajasthan*. pp. 48.
- Jharwal, S.M. 1999. *Public Distribution System in India*. New Delhi: Manak Publication Pvt. Ltd.
- Khan, Y. 1988. *Climate and Dryland Ecology*. Rawat Publications. Jaipur and New Delhi: 1988.
- Mathur, K.; and Jayal N.G. 1993. *Drought, Policy and Politics in India—The need for a long-term perspective*. New Delhi: Sage Publications.
- Planning Commission India. 1994. Report of the Technical Committee on Drought Prone Areas Programme and Desert Development Programme. *Indian Journal of Agricultural Economics*. 69(4):624.
- Rathore, M.S. 2003a. *Pro-Poor and Gender Sensitive State Water Policy—NGO's Perception on Water Resource Management in Rajasthan* submitted to UNDP, New Delhi.
- Rathore, M.S. 2003b. Community Based Management of Ground Water Resources: A Case Study of Arwari River Basin. *British Geological Survey*. Wallingford. U.K.
- Rathore, M.S. 2004. *Adaptive Strategies to Droughts in Rajasthan*. Jaipur: Institute of Development Studies.
- Radhakrishna, R.; and K. Subbarao. 1997. *India Public Distribution System—A National and International Perspective*. World Bank Discussion Paper No. 380. Washington, D.C.: The world Bank.
- Sagar, V. 2003. *Food Security Issues in a State of Large Agricultural Instability: Rajasthan*. IDSJ Working Paper No. 128. Jaipur: Institute of Development Studies.
- Taylor, J.G. 1987. Perception of Drought in the Ogallala Aquifer Region of the Western U.S. Great Plains in Wilhite DA et al.(eds). *Planning for Drought—Toward a Reduction of Societal Vulnerability*. UNEP. PP. 409-421.

**Postal Address:**

P O Box 2075Colombo  
Sri Lanka

**Location:**

127, Sunil Mawatha  
Pelawatta  
Battaramulla  
Sri Lanka

**Tel:**

+94-11 2787404

**Fax:**

+94-11 2786854

**E-mail:**

[iwmi@cgiar.org](mailto:iwmi@cgiar.org)

**Website:**

<http://www.iwmi.org>