

[Final Report]

**Multiple Impacts of Droughts and Assessment
of Drought Policy in Major Drought Prone
States in India**

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Project Report Submitted to:
The Planning Commission, Government of India, New Delhi

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November, 2007

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Acknowledgement

This study is a result of initiatives taken by the Planning Commission, Government of India, to investigate the multiple impact of drought in one of the India's drought prone states i.e. Gujarat. We express our gratitude to the Planning Commission for the support of the study. The support and cooperation provided by the various departments of Government of Gujarat at Gandhinagar has been deeply acknowledged. We would also like to thank all the Taluka Development Officers and staffs in which we conducted the extensive survey during April/May 2006, without their active support and help of Talati the survey could not have been possible. We express our sincere gratitude to the 'Surpanches' and villagers who have shared their experiences and enriched our knowledge by way of discussion during our field visits to all the 12 villages in 6 districts of Gujarat. We have no words to thank those respondents who spared their time to answer our long list of questions in the middle of peak summer days.

We would also like to thank our colleagues at CFDA who have actively participated in survey work. We thank Mr. Kanubhai Lakum, Mr. Raghu Bhai Desai, and Mr. Jashubhai Makwana for their active involvement in the survey work during our field visits. Their support in data entry and tabulation is also duly acknowledged. The study would not have seen the light of day without their support. We would also like to thank our Research Assistant, Mrs. Jotika S. Shah for her support in tabulation and formatting of the study. She has been a real support for organizing this report. Our sincere thank to Mrs. Roja Nair who provided all secretarial help during our study. We would also like to thank Dr. Shital Lodhia for her active support in this study.

Date: 20-04-2007
Place: Ahmedabad

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Chapter One

INTRODUCTION

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Introduction

Drought is one of the most frequently occurring national disasters in India. With its increased frequency and expanded coverage in the recent years, about one third of the country is either drought prone or under desert areas. These areas are lagging behind in agriculture and also in overall economic growth. They experience wide year-to-year fluctuations in agricultural production and incomes and have a relatively high incidence of poverty. The poor in these regions are highly vulnerable to a variety of risks due to their low and fluctuating incomes, high indebtedness and low human development. Helping the poor to come out of vulnerability and poverty and integrating the drought prone areas into the mainstream of development is a serious challenge faced by policy makers at present.

Droughts and famines have received attention of rulers in India right from the 13th and 14th century. Muhammad Tughlakh was perhaps the first Sultan to take systematic steps to alleviate efforts of droughts by distributing grains to drought affected people in Delhi in 1343 AD (Loveday 1985). This approach was followed and improved upon by Mughals and many other kings and rulers later on. During the British period also efforts were made to provide relief to droughts / famine affected people by organizing relief works and food distribution, distribution of fodder, loans to farmers to start cultivation in the next season etc. The first Scarcity Manual was prepared by the British Government in 1883, which was followed by other manuals by some provincial governments (Hirway 2001), The Royal Commission on Agriculture in 1928 recommended promotion of dry land farming to promote agriculture in famine affected regions. However, the efforts were scanty and there was an alarming increase in the frequency of during the British period (Bhatia 1967).

After independence droughts have received much more attention of policy makers than before. One observes an evolution in the drought policy over the past few decades. Famines have been eradicated and starvation deaths are rare if not nil. The government has adopted a three pronged strategy to face droughts: (1) providing relief to drought hit population under scarcity relief programmes (2) designing special area development programme for drought prone areas and desert areas (DPAP – drought prone area programme and DDP – desert development programme) and (3) promoting dry farming agriculture as a part of agricultural policy.

Somehow this approach has not worked very well, as is evident from the increasing drought prone areas in the country and the relatively high poverty and vulnerability of people living in these areas. These areas are lagging behind in growth and tend to remain isolated. The new opportunities of globalization are likely to bypass these regions if adequate steps are not taken to integrate them into the mainstream economy. There is

therefore a need to investigate (1) whether the drought policy in India has been able to address the multiple dimensions of droughts adequately, (2) whether the policy needs to be reoriented or modified, (3) whether there is a need to reorganize its implementation and (4) what kind of measures are needed to enable drought prone areas to access the new opportunities under globalization. The proposed study intends to undertake this investigation.

Focus of the Study and Objectives

Large number of research has been done by scholars on the incidence and intensity of droughts, impact of droughts and drought policy. Hanumantha Rao, Ray and Subbarao (1988) in their pioneering study on unstable agriculture and droughts found that agriculture in drought prone areas has been highly unstable. They observed that some water scarce states like Gujarat experienced low to medium growth with high instability in the 1970s and 1980s. They also observed that production instability varied with crops: Variations in food crops were less than non-food crops, traditional crops were more sensitive to rainfall than new crops, and variations in Rabi crops were less than the same in Kharif crops. All these factors affect the cropping pattern in drought prone regions, frequently affecting agricultural growth adversely (Ray 1988). It is also observed by scholars that increase in crop productivity due to intensive cultivation and application of new technology also increases crop instability because it requires intensive water use which is highly sensitive to water use. Another study in Haryana (GoH 1977) also has shown that droughts result in unstable agricultural production, but the instability is more in Kharif crops and less in Rabi crops.

There is some evidence to show that unstable agricultural incomes tend to raise the incidence of poverty and also vulnerability of poor (Desai et al 1979 and Chen 1991). The coping strategies of farmers in droughts frequently go against their long-term interests. For example, borrowings (at high interest rates), mortgage/sale of assets, migration etc. frequently leave the households worse off in the long run. This adverse impact frequently pushes poor households in “a poverty trap”, which increases the intensity of poverty of poor households and affects the well being of women and children highly adversely.

Another important area of research has been the designing and implementation of drought relief works (Dreze 1988, Hirway 2001). These studies point to the inadequacy of drought relief works in terms of providing relief as well as promoting drought proofing. These studies have shown that the concept of providing short term drought relief during drought periods without much reference to the major constraints and problems of drought prone areas does not help the region or the poor in any significant way. Also, drought relief works are not very effective due to their procedural rigidities, inadequate funds and poor planning.

Several scholars have evaluated the DPAP (Drought Prone Area Programme), which is a major intervention for the development of drought prone areas. This programme has undergone a lot of changes during the past few decades. Thanks to the Technical Committee headed by C H Hanumantha Rao in the early nineties, this programme is now based on a systematic approach of watershed development. Though the earlier evaluation

studies of this programme are highly critical of its performance, the recent studies have shown that there is a significant improvement in the programme, largely brought about by the new approach. However, how to connect drought proofing to watershed development still needs careful investigation, as the even after watershed development, many areas are still far from drought proofing.

This huge literature on droughts, however, is inadequate on several counts. First of all, the impact of droughts is examined only in a limited way – in terms of its impact on agriculture, sufferings of affected people such as farmers, labourers, women, children etc. The long term impact of drought has not been examined comprehensively in terms of its multiple dimensions.

- Its long term impact on agriculture in terms of farmers' adjustment to uncertain rainfall and uncertain agricultural prospects
- Its long term impact on the economic growth of drought prone regions through poor performance of agriculture and of the overall economy
- Its impact on environmental resources like water, forest, land etc and biodiversity including damages to animal and plant species, which tend to raise the frequency and intensity of droughts in the long run and which affect the life and livelihood of people adversely
- Its impact on income poverty, vulnerability, and human poverty, which tend to raise the incidence of chronic poverty and of vulnerability of the poor,

Secondly, there is a need to study the impact of some of the recent interventions on drought proofing. Watershed development has now emerged as a major component of DPAP programme, and many studies have been done to examine its impact on soil-water management. However, there is a need to link this programme with drought proofing of drought prone areas. It is important therefore to investigate whether this has happened or not, and how this can be brought about.

Thirdly, drought policy at present appears to be fragmented as the three components of the policy (i.e. scarcity works, DPAP and watershed development and agricultural policy) are almost independent of each other. Though some scattered efforts have been made to link the three components, they have not been very successful. How to bring the three components together to formulate a comprehensive drought policy is a question that needs to be studied carefully and systematically. In this context several questions need to be examined: (1) Integration between agricultural research, problems of drought prone areas and agricultural extension and training, (2) establishing linkages between scarcity relief works and drought proofing, (3) Extension of watershed development projects to stable agricultural growth, (4) prediction of droughts and developing drought information system to help farmers in taking appropriate decisions regarding cropping and cultivation practices etc.

And lastly, there is a need to look at drought prone areas for their integration into the mainstream development and for enabling them to access the new opportunities provided by globalization. There is a need to study how this can be done.

Objective of the Study

The specific objectives of the study are as follows:

- (1) To examine the multi-dimensional impact of droughts in a major low rain fall drought prone state, Gujarat. The multiple dimensions of the impact will include short term and long term impact on (a) agriculture and on the overall economy, (b) natural resources, such as ground and (surface water) land, vegetation and forestry etc, and (c) on poverty and human development, i.e. income poverty, health and nutrition, literacy and education etc.
- (2) To study drought policy in the State and assess the strengths and weaknesses. The drought policy will include all the components of the policy
- (3) To investigate specific drought related issues like drought prediction, agricultural research for drought prone areas, scarcity relief works, impact of watershed development on stabilizing agriculture, case studies of successful drought proofing etc.
- (4) To infer implications for mainstreaming drought prone areas in economic development and for enabling these areas to access opportunities under globalization.

Major Research Questions/Hypotheses

Trends in the Incidence of Droughts and Impact of Droughts

Drought is a complex and widely spread phenomenon observed in low rainfall as well as high rainfall regions and in plains as well as in hilly regions. It is a weather related natural disaster, which can be defined meteorologically in terms of quantity of rainfall and its spread. The *Meteorological* definition, which is a most prevalent definition of drought, is based mainly on the degree of dryness and the duration of the dry period. According to IMD (Indian Meteorological Department) drought is a situation when the rainfall is less than 25 percent of the normal rainfall. The meteorological definition, however, need not coincide with the hydrological or agricultural definition of drought.

Hydrological drought: Hydrological drought is a situation when the surface and ground water levels fall below the average levels and are affected not only by precipitation but also by infiltration and evaporation. Hydrological dimension of drought refers to the water distribution on land surface after precipitation has reached the ground. Major indicators of hydrological drought are low reservoir storage, inadequate stream flows, aggregate runoff less than long term average runoff and precipitation at high elevation. Its frequency is defined on the basis of its influence on river basin: SWSI (surface water supply index) is mostly used to measure hydrological drought.

Agricultural drought: Agricultural drought refers to shortage of water for crop growth or consistently high soil moisture deficiency over the growing season. Major indicators of agricultural drought are shortage of precipitation – departure from the normal, abnormal evaporation, deficiency of sub-soil moisture etc. Its intensity depends on the difference

between plants water demand and water availability. Crop moisture index (CMI) is used to measure agricultural drought.

Ecological drought: Ecological drought occurs when primary productivity of natural or (managed) ecosystem declines significantly owing to reduced precipitation. Socio-economic drought incorporates features of all the above types of droughts. It occurs when precipitation is not sufficient to meet needs of human activities.

Though meteorological drought is mainly a natural phenomenon, a natural disaster, the intensity of its impact on hydrological, agricultural and ecological droughts can be reduced by appropriate interventions, which, in turn, can also impact on socio-economic droughts. The crux of drought policy is to reduce this impact so as to reduce the adverse impact of droughts on human well-being. The impact of droughts varies with the time scale of droughts. The longer the period of drought and the larger the number of consecutive droughts, the greater will be its impact on agriculture, ecology and economy. The regions, which are subjected to frequent droughts, therefore need careful attention of policy makers.

It is important therefore to study short term and long term impact of droughts in drought prone areas to understand the multiple problems faced by people in these regions and to design suitable policy interventions.

The impact or consequences of droughts are multiple and differ in short term and long term. The likely consequences can be broadly divided into the following:

- ❑ Short term impact in terms of loss of food production and non-food production, loss of employment; shortage of water, fodder and fuel wood; indebtedness, migration etc.
- ❑ Long-term impact on agriculture in terms of low investments by farmers, loss of soil moisture and decline in land productivity, low agriculture growth and low development of the region.
- ❑ Adverse impact on macro economic growth of the region emanating from low and unstable incomes, low economic growth, and coping strategies like migration.
- ❑ Impact on Environment and Ecology: Frequent droughts tend to result in depletion and degradation of natural resources, which in turn tend to affect life and livelihood of many people.
- ❑ Droughts tend to affect adversely certain social groups like women, children, households belonging to scheduled castes and scheduled tribes, as these groups are already in disadvantageous situation within households or within the society.

The first major research area therefore is to study the multi dimensional impact, short term and long term, on the economy, ecology, poverty & vulnerability, and human development in drought prone regions. This calls for careful analysis of the secondary data and conducting primary surveys to fill in the gaps.

Assessment of Drought Policy

The second major research area is to assess the drought policy at the conceptual level as well as at the empirical level.

One can say that a good drought policy should lead to drought proofing of drought regions. Drought proofing has two major components: (a) Drought proofing at the household level and (b) Drought proofing at the regional level. Drought proofing at the household level is expected to provide affected households with security of income and livelihood, security of food, and security of water, fuel/fuel wood and fodder. At the regional level drought proofing is expected to ensure stabilization of agricultural production, and agricultural incomes, balanced and sustainable use of land and water (and other natural resources), sustainable agricultural growth and integration of drought prone areas in to the mainstream economy. Drought policy in India should be assessed with reference to this concept of drought proofing.

Assessment of drought policy has included the following research questions:

- ❑ Assessment of drought relief works implemented under Drought Relief Code for providing relief and minimizing hardships under droughts.
- ❑ Assessment of drought prediction or drought related data provided to farmers to cope with droughts- to minimize production losses.
- ❑ Support provided by agricultural policy for stabilization of agricultural production and incomes- in terms of research, extension, training, infrastructure development etc.
- ❑ Environmental policy that aims at protection degradation of natural resources and at promoting their sustainable use.
- ❑ Policy aiming at poverty alleviation- i.e. reduction in income poverty, reduction in risks and vulnerability of poor and reduction in human poverty.
- ❑ Assessment of the performance of DPAP programmes, and particularly contribution of watershed development programmes in drought proofing.
- ❑ Policy for gender equality and protection of women's well being.
- ❑ And finally policy that diversifies the economy to reduce the risks and to mainstream drought prone areas in to the mainstream development.

Drawing Inferences for an Integrated Drought Policy

Assessment of each of the components of drought policy will have implications not only for the individual components of the policy but also for a comprehensive drought policy that connects the different components meaningfully in to a well designed policy at the macro level. The indicators of drought for the different regions will help in designing suitable interventions for the different drought prone regions. The aim of the study is to provide sound statistical basis for formulating and monitoring drought policy.

Approach of the Study

As seen earlier, the study focuses on Gujarat.

Introduction to Gujarat:

Gujarat state was formed in the year 1960 when the erstwhile bilingual Bombay State was split into two separate states; *Gujarati* speaking Gujarat State and *Marathi* speaking

Maharashtra state. With its enterprising population and committed leadership Gujarat has done well since then in terms of overall economic growth. It has progressed to acquire the 4th rank in per capita income among the major states in India and has maintained this rank for the last two decades or so. Today it is one of the prosperous states of India with about 50 million population (2001) spread over 196,000 sq. km.

The state gets highly unevenly distributed rainfall, varying from 300 – 350 mm in Kachchh to 600 – 700 in Saurashtra and North Gujarat to more than 1500 mm in South Gujarat. The low rainfall in many parts of the state is highly erratic in nature. Gujarat is a highly drought prone state. Out of the total 184 talukas (old talukas), 52 talukas are covered under the DPAP (Drought Prone Area Programme) and 47 talukas are covered under the DDP (Desert Development Programme)¹. That is, about 99 talukas and more than 60 per cent of the area of the state is subjected to frequent droughts. In major droughts, some additional areas also suffer from poor rainfall. The incidence of droughts is quite high in the state. In every five years, 2-3 years are drought years and in every ten years there are 2-3 severe and widespread droughts, which are frequently consecutive. In normal years also about 10 to 15 per cent of talukas are declared drought affected and scarcity works are undertaken here.

It has been observed that the frequency and intensity of droughts have increased in the state over the years. However, deaths due to famines are almost eradicated, as food grains are made available to drought-affected people. A few deaths, however, have been reported on scarcity works due to other reasons. The other change is that the droughts now are accompanied by serious drinking water shortages. This is because of severe depletion of water resources in the state in the recent decades. Till about the sixties and seventies it was possible to dig wells/bores/tube wells to access drinking water.

Methodology of the study

Selection of Districts/Talukas/Villages/Households

The relevant secondary data has been collected from the State to understand the nature and incidence of the drought in the state. Using the secondary data, six districts and an equal number of talukas have been selected from each district. Followings are the list of Districts and taluka selected for primary survey.

¹ The number of talukas has now increased to 225.

Selected District and Taluka for Primary Survey, 2006

Sl.No	District	Talula	Area	Regions	Agro-Climatic Regions
1	Kachch	Abdasa	DDP	Coastal	North-west Arid
2	Banaskantha	Vav	DDP	Inland	North Gujarat
3	Surendranagar	Lakhtar	DDP	Inland	North Saurashtra
4	Panchmahal	Halol	DPAP	Tribal	Middle Gujarat
5	Junagadh	Veraval	DPAP	Coastal	South Saurashtra
6	Bharuch	Janbusar	DPAP	Tribal	South Gujarat

The selection of districts/Taluka is based on coverage of drought and drought proneness. Three districts/taluka have been selected from DDP districts and three from DPAP districts. These districts also represent tribal, coastal and inland districts and fall under almost all the sub agro-climatic regions of Gujarat. Two villages have been selected from each talukas based on the following criteria.

Selection of Villages: Two villages from each taluka /districts have been selected. Selection of village is based on simple criteria, a) Remoteness and diversification; and b) Size of the villages. One village was selected near to the taluka headquarter (Town/city) and another one is selected far from the taluka's nearest town and city. This method was applied to all the villages in each region. However, coastal villages were selected on the basis of distance from the coast. We selected villages in coastal region within 5 km from the coast. We have taken immense care to avoid either very large or very small size villages from each taluka to get better characteristics of rural area in drought and drought prone regions in Gujarat

Selection of Sample Households: Stratified sample selection for household was used to determine the number of households to be selected from each village. Complete house listing survey was carried out in all the 12 villages in first round of survey. Based on the occupation category, we selected households by proportionate sampling methods. We took 20 percent households from each occupation category from all the villages. A faire representation of households was also given in selection to capture out-migrating households in this region. The following table shows the details of household sample in all the villages.

The data collection has been done from secondary sources as well as primary sources. Primary data collection has been done through well-designed structured questionnaire based on recall methods primary surveys. The collected information and data has been analyzed using appropriate technique and methods. Special focus has been put on women and children to understand the impact of droughts on these vulnerable groups.

Database of the study

Secondary Sources of Data Base:

Sl. No.	Sector	Parameters/ Indicators	Data Sources	Levels of Information
1	Agriculture	Major Crop-wise Area. Production, yield, (year 1971-2002-03)	Directorate of agriculture, Government of Gujarat	State & Districts wise & DDP – DPAP , Other
2	Droughts	Data (1973 to 2004) 1. No of affected Taluka 2. No. of Affected Village 3. Total Area of Taluka (in Ha.) 4. Area under Drought (Ha.) 5. Drought Affected Population Livestock Affected by Drought	Directorate of Relief, Gujarat State, Gandhinagar	Districts wise & DDP /DPAP and other
3	Land Use	Land Use Classification (Year 1971-2001)	Department of Agriculture, Government of Gujarat,	Taluka & District and DDP / DPAP and Other
4	Environment	1. Levels of Ground water development (Year 1970 & 2002) 2. Forest coverage area in Gujarat (year 1991 to 2001) 3. Rainfall Data (Year 1971 to 2004)	1. Report of GWRE 1997, Government of Gujarat 2. Agriculture statistics of Gujarat, Government of Gujarat 3. Directorate of economics and statistics Govt. of Gujarat.	State, District And Taluka in DDP and DPAP regions
5	Health	Achievement under the applied nutrition programme during (1970-80)	Directorate of Health, Medical Services and Medical Education, (Health Section), Ahmedabad.	District wise
6	Education	1. No. of Primary School, Student and teacher (year 1984 to 2001) 2. Higher secondary data Student (No. of boys & Girls) and teacher (No. of Male & female) year 1997-98	Directorates of Primary and Secondary Education, Government of Gujarat	State & District wise
7	Poverty	BPL family by income group (year 1991-92)	Government of Gujarat	District & Talukas wise
8	Livestock	No. of cattle, Milch animals and total livestock (Year 1982-2003)	Livestock Census, Directorates of Agriculture and Animal Husbandry, Government of Gujarat	District & Talukas wise

Scheme of Chapterisation

The present study has been divided into 7 major chapters. They are the followings:

1. Introduction
2. Droughts and Drought Prone Areas: A Profile
3. Droughts and Natural Resources
4. Impact of Drought on Agriculture and Farmers Response to Drought
5. Droughts, Vulnerability and Human Development
6. Adequacy of Drought Mitigation Measures and
7. Drought Mitigation and Management Policy in Gujarat

The introduction chapter presents brief backgrounds of the Study. It further elaborates the focus of the study, specific objective and hypothesis along with a detail methodology adopted for research purposes. A details list of various sources of data from secondary sources has been given in this chapter. A brief on the contents of various chapters has also been presented in the first chapter.

Second chapter brings about a complete profile of the study area in terms of its various characteristics. The extent of drought and its regional coverage is assessed in this chapter. A micro picture on the status of physical and social infrastructure in the rural areas of drought and drought prone regions of Gujarat has also been presented in this chapter. Various critical issues especially issues of drinking water has been highlighted with the help of empirical evidence in this chapter.

Drought and its impacts on natural resources have been dealt in the third chapter. The status and long term change over time have been analysed with reference to Land Use, Waster Resources and Forest across the drought and drought prone regions in the state. Household level impacts of drought on natural resources particularly on sources drinking water has also been measured and a seasonal variation has also been captured in the supply of drinking water during both normal and drought year in this chapter.

Chapter four deals with the most critical aspects of the impacts of droughts on agriculture in drought and drought prone regions in Gujarat. Agricultural performance has been seen with the help of both secondary information at regional level and also at household level across the selected villages in DDP and DPAP areas of Gujarat. The status of farmers and their response to drought has been assessed in this chapter. Copping strategies to drought and relief measures have also been evaluated for agriculture development in drought regions in the state. The status of livestock and animal husbandry have been assessed at both at taluka and household levels across DDP and DPAP areas in the state.

Multiple impacts of drought in terms of vulnerability and overall human development in drought and drought prone regions of Gujarat have been examined in the 5th chapter. The critical household issues such as poverty, in debtness, migration, education, health and nutrition etc. are assessed at the household level in 12 selected villages in desert and drought prone areas in the state. An overall vulnerability index for desert, drought and

other taluka has been developed to measure the extent of vulnerability due to drought in the state.

Chapter six examines the adequacy of drought mitigation measures in the state. The drought mitigation strategies of National and State Government have been critically evaluated in this chapter. Adequacy and appropriateness of current relief work in the state has been assessed both at the state level and also at the household levels in this chapter. People's own coping strategies with drought has been identified with help of field survey, is the highlight of this chapter. Last but not the least, the policy implication in the drought regions of the state has been dealt in Chapter seven. The various policies that have been adopted so far are discussed in detail in this chapter. A framework for new strategies for drought proofing, mitigation and management has been prepared through this study.

Scope and limitation of the Study:

Study is area-based study, which pertains to drought and its multiple impacts in Gujarat. The conclusions drawn in this study is specific hence a generalisation may be avoided. However, assessment of drought policy has been done with the help of broader national policy framework and state specific policy in drought mitigation. Farmer's responses are based on recall methods and are highly subjective in nature, however; overall response gives fair idea of multiple impacts of drought in dry regions in the state. Policy implications for drought and drought prone areas of Gujarat may hold good in similar conditions especially in arid and semi-arid regions in India.

Annexure: I

Table: 1 Sample of Households from each village in the study area

District Name	Name of Taluka	Name of Village	DPAP / DDP Village	No. of Total HH	No. of Sample HH
1. Surendranagar	11. Lakhtar	111. Gangad	DDP	182	31
		112. Kalam	DDP	167	31
3. Kachchh	31. Abadasa	311. Moti Sindhodi	DDP	160	30
		312. Shuthari	DDP	377	73
4. Banaskantha	41. Vav	411. Joravargadh	DDP	256	49
		412. Limbala	DDP	242	53
2. Junagadh	21. Veraval	211. Malondha	DPAP	224	41
		212. Badalpur	DPAP	211	40
5. Panchmahal	51. Halol	511.Kansaravav	DPAP	107	23
		512. Kherap	DPAP	164	31
6. Bharuch	61. Jambusar	611. Ankhi	DPAP	516	97
		612. Dehari	DPAP	152	31
Grand Total				2758	530

Chapter Two

**Droughts and Drought Prone
Areas: A Profile**

Chapter Two

DROUGHTS AND DROUGHT PRONE AREAS: A PROFILE

Introduction

Drought is a complex weather anomaly that occurs widely and frequently in a particular space and time. It may occur in low rainfall regions as well as high rainfall regions. It also prevails in plains and in hilly regions. It is a weather condition of a particular place in terms of the quantity of rainfall and its spread over time. According to Indian Meteorological Department (IMD) drought is a situation when the total precipitation is less than 25 per cent of its normal. If this deficiency of rainfall is unnoticed for a considerable amount of time it may turn out to be a natural disaster. In another words droughts are uncertain and are difficult to predict. Therefore, it is important to understand various concepts of droughts before we present the profile of drought prone areas in Gujarat.

Concepts of Droughts: Droughts can be defined in a number of ways as we have various measures to identify drought conditions in a particular space and time. **The meteorological drought**, which is widely accepted, is based on the degree of dryness and the duration of dry period. It defines drought conditions when precipitation is less than 25 per cent to its normal in a particular region (Normal rainfall are calculated on the basis of average rainfall for more than a 30 years period i.e. climatological mean for a particular area, however, a longer period say 100 years average gives better result of normal rainfall). The meteorological definition of drought does not include hydrological, ecological and man-made factors into consideration. **Hydrological drought** conditions occurs when there is marked depletion of surface water causing very low stream flow and drying of lakes, reservoirs and rivers. The major indicators of hydrological droughts are low reservoir storage, inadequate stream flows, aggregate runoff less than long-term average runoff and precipitation in high elevation. Its frequency and occurrence is arrived using SWSI (surface water supply index). Whereas **Agricultural drought** is defined when inadequate soil moisture produces acute crop stress and affects productivity. Crop Moisture Index (CMI) is used to measure agriculture drought. **Ecological droughts** occur when primary productivity of natural or managed ecosystem declines significantly owing to reduced precipitation in long run. **Socio-economic droughts** are the aggregate of all the above droughts when precipitation is not adequate to meet the needs of human activities.

Drought conditions are induced by low precipitation or when monsoons are delayed. It is observed that 16 per cent of country's total area is prone to drought affecting 50 million populations annually (National Centre for Disaster Management, NCDM). If drought conditions go unnoticed, they culminate into a natural calamity. (Bajpai, *et.al.*, 2005) They impact not only a particular region that experiences it but they also impact household in the region. In the long run impacts can be seen in terms of reduction in the agriculture produce at regional level leading to reduced contribution to the overall economy of that region. It becomes more prominent in the area where agriculture is a dominant activity (Rao, *et.al.*,

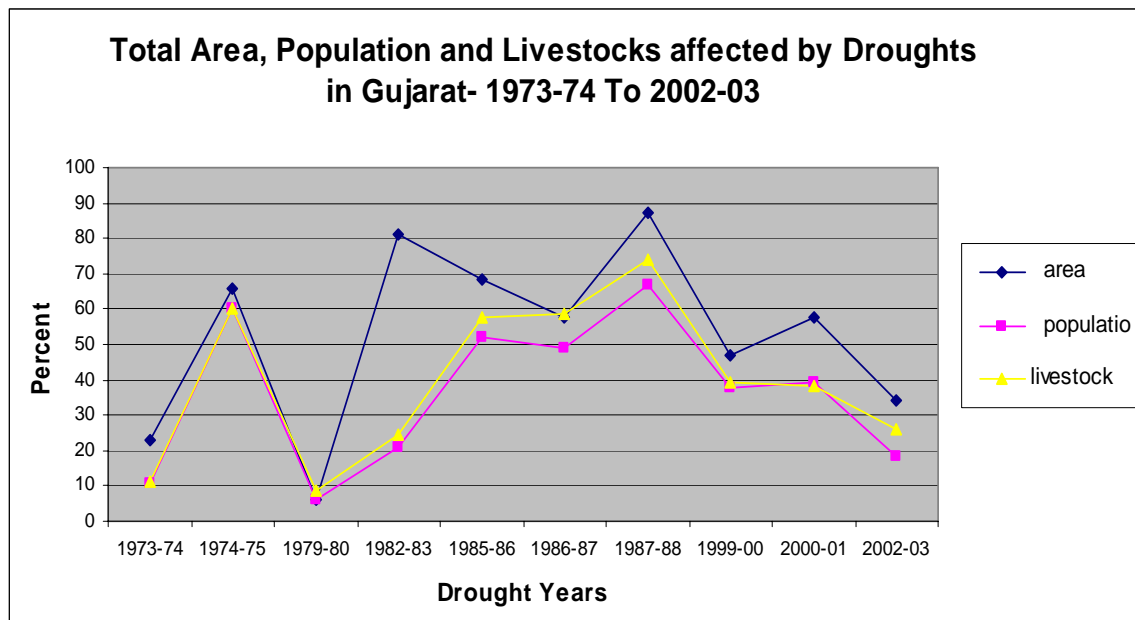
1988). At household level in short run, it impacts in term of reduced income, employment and poor intake of nutrition due to low production of food item. In the long run, household in the drought affected regions falls into the vicious circle of poverty (Hirway, 2001). Generally, drought is frequent in arid and semi-arid regions in India. Large part of the north west India falls under arid and semi-region including the state of Gujarat. Gujarat is a major drought prone state of India which witnesses drought in every 3-4 years. However, the trend for last 35 years shows that drought phenomenon occurs almost every year and had also lead to scarcity and semi scarcity conditions in some or the other parts of Gujarat (Vora and Parikh, 1996).

Drought and Coverage of Drought Prone Areas in Gujarat

Incidence and Severity of droughts in Gujarat

Gujarat has long history of frequent droughts, which leads to large-scale scarcity works across the districts. Figure 2.1 shows occurrence of drought during the last 3 decades. There were nine major droughts during these periods with coverage of state's total areas ranging from 23 percent to almost 90 percent.

Figure 2.1



Source: Department of Revenue, Government of Gujarat, Gandhinagar

During early 1970s there were two major droughts whereas during the 1980s, which was worst decades so far has witnessed 4 major droughts in the year 1982-83, 1985-86, 1986-87 and 1987-88. Again during late 1990s and early years of present century there were three major drought years among which the worst was the drought of 2000-01 which covered 92% of total districts and more than 57% of area of the state. So far in the last 3 decades drought of 1987-88 affected more than 87% area of the state. This was the worst ever drought during 1973-74 to 2004-05.

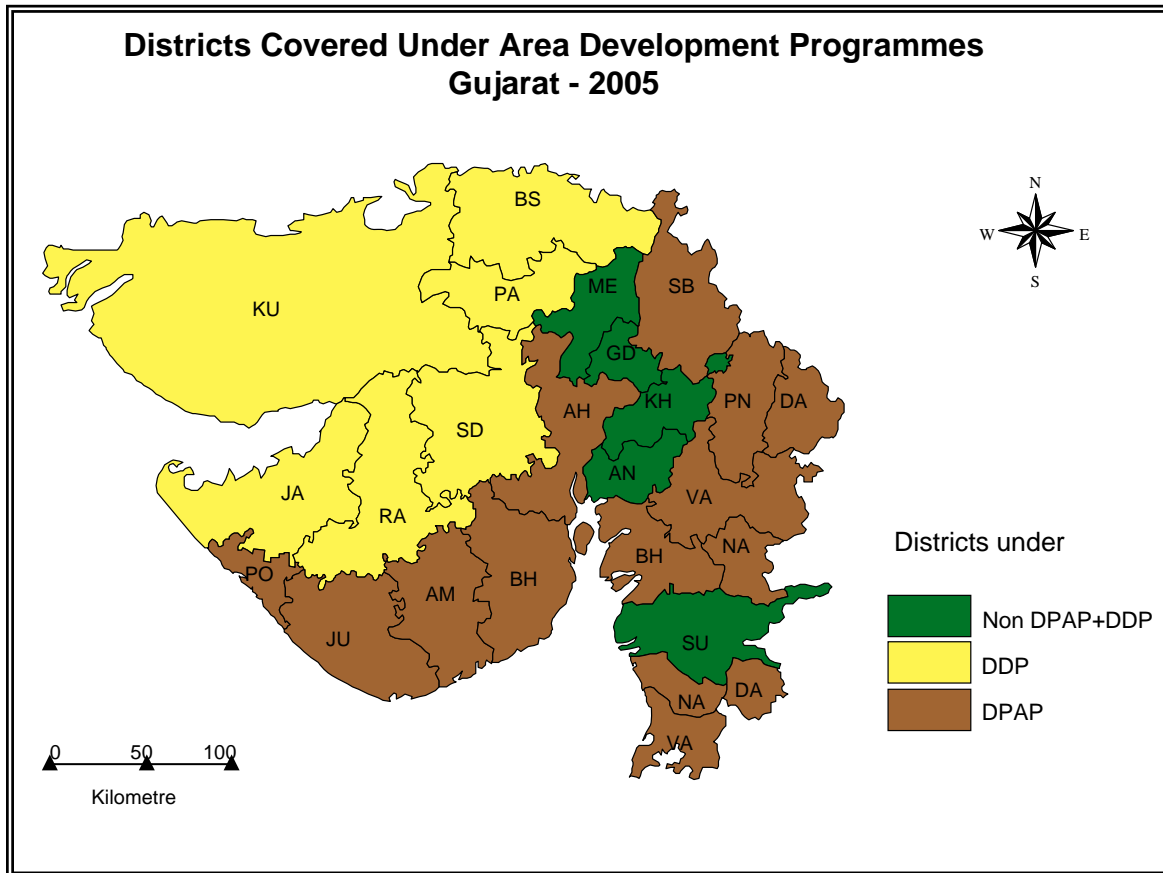
In almost all these major drought years total population of the state affected varies from 18% in 2002-03 to almost 67% in the years 1987-88. While total area of the state affected in the range of 23% in 1973-74 to 87% in 1987-88. Total livestock of state reported affected were 11% during 1973-74 drought and 74% during 1987-88 drought. Thus the severity of drought in terms of total area, population and livestock effected in the states varies from year to years, however, their coverage were as high as 87%, 67% and 74% respectively during the last three decades.

In terms of geographical coverage of drought and drought prone area, more that 50 per cent of the total area of the state are covered under the Area Development Programmes namely under DDP and DPAP programmes (See Table 2.1). There has been 18 per cent increase in the geographical coverage of area under the Area Development Programmes in the State during the last two decades from 1981 to 2001. The increase in area under these two programmes has been largely due to recommendation of Hanumanth Rao Committed report in the 1993-94. There has been almost 7 times increase in the geographical coverage of DDP during 1981 to 2001 while DPAP coverage has shown decline. The decline in DPAP area is due to transfer of these areas into DDP. Entire districts of Surendranagar and Kutch were transferred from DPAP to DDP, which resulted in large increase of area under desert development programmes. This particular phenomenon indicates the deteriorating soil moisture conditions in the state over time and space.

Geographical Coverage of Area Development Programmes

Table 2.2 shows coverage of these areas by number of districts and talukas in the state. Out of 25 districts 20 districts are under the area development programmes except for 5 districts namely Anand, Gandhinagar, Mehsana, Kheda, and Surat. There are 14 districts and 67 talukas under DPAP whereas 6 districts and 52 talukas are under DDP across all the agro-

Figure 2.2

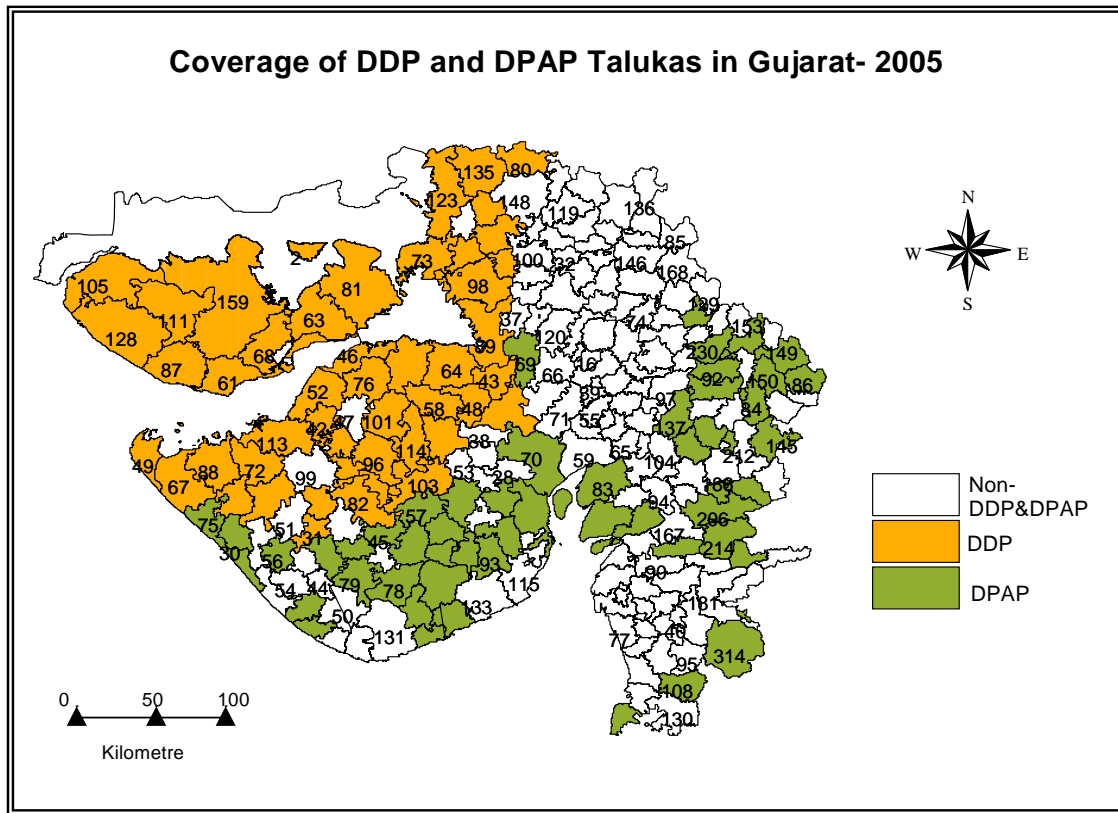


Source: Department of Revenue, Government of Gujarat, Gandhinagar

Climatic regions. In other words 80 per cent of the districts and 53 per cent of the talukas are under drought and drought prone areas in the state.

Districts covered under DDP extend from North to Northwest, which includes Banaskantha, Patan and Kutch (See Fig. 2.2). They also include districts of Surendranagar, Rakjot and Jamnagar from Northern Saurashtra. These districts are contiguous and fall under low rainfall zone with high fluctuations in their average annual rainfall. DPAP districts are wide spread which extends from Eastern Hill and Tribal Region to South Gujarat. Sub-humid districts such as Dang and Valsad have also been included in the Drought Prone Area Development Programmes. They are the regions of relatively high rainfall with greater fluctuations in average annual rainfall from year to year.

Figure 2.2a



Source: Department of Revenue, Government of Gujarat, Gandhinagar

The extent of drought and drought prone areas in the state suggest that almost every part of climatic regions -arid, semi-arid and sub-humid are under the influence of drought and drought proneness across agro-climatic regions of the state. This has resulted in backwardness of these regions in many aspects. The micro level characteristics of DDP and DPAP areas reveals disturbing phenomenon which needs both short term and long terms measures to correct them.

Characteristics of Drought Prone and Desert Area: Village Profile

Severity of drought

Perpetual drought conditions and frequent occurrence of droughts in DDP and DPAP regions are usual phenomenon in the state. (Following) Table 2.3 shows frequency of droughts in the selected villages both in DDP and DPAP areas.

Occurrence of drought in the selected villages- 2000 to 2005

Year/type of districts	Experience of Drought during last five years					
	Drought declared /Village name					
	2000	2001	2002	2003	2004	2005
DDP			Gangad	Moti Sindhodi	Moti Sindhodi	Moti Sindhodi
	Kalam		Kalam Joravargadh	Suthari	Suthari Joravargadh	Suthari
		Limbala	Limbala	Limbala		
	DPAP		Malondha	Badalpur		
	Kansaravav	Ankhi	Kherap Ankhi		Dahari	

Source: Field Survey, April/May 2006

The perpetual droughts have been observed more in case of DDP villages than that of the DPAP. Almost all the villages in DDP districts have experienced at least two droughts in last five years except for Gangad in Surendranagar district. Both villages in Abdasa Taluka in Kutch i.e. Motisindhori and Suthari and Limbala in Vav, talukas of Banaskantha districts have experienced consecutive three years of drought periods during the same period. This indicates that there exists a perpetual drought conditions in DDP villages especially in Kutch and Banaskantha districts. However, except for Ankhi villages in Jambusar taluka of Bharuch, all other villages of DPAP areas have experienced only one drought in the last five years. Ankhi had experienced two consecutive droughts in the year 2001 and 2002 respectively. The current phenomenon of frequent and perpetual droughts in this area further aggravates the problems and results in backwardness to some extent. The backwardness of these areas has been reflected in their characteristics, natural resources and problems of drinking water.

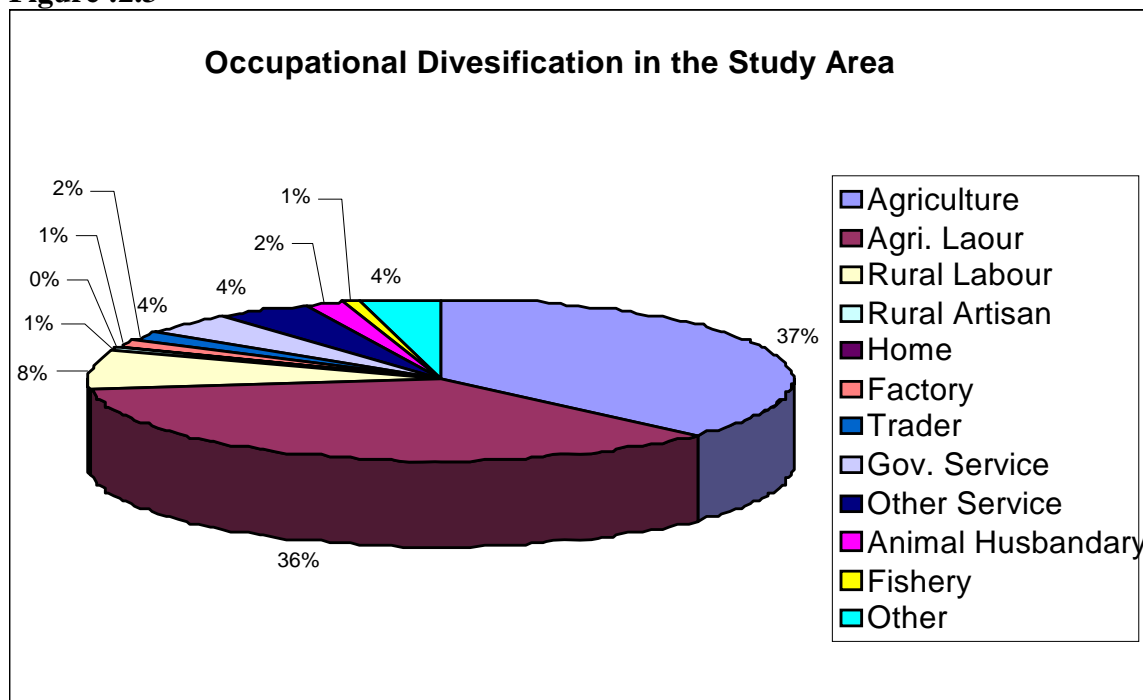
The characteristics of drought and drought prone villages is assessed in terms of their occupational diversifications, caste compositions, literacy, size of landholdings, income distributions, status of out-migration from the villages etc. These villages are showing very low occupational diversification and low level of literacy. Distribution pattern of major caste groups in these villages are similar to state level distributions, however, they have suffered due to frequent droughts.

Occupational Diversification in the villages

Table 2.4 shows occupational diversification of selected villages. Main occupation in these villages is dominated by agriculture and agricultural labour and other labourers which together account for more than 80 per cent of the total households. This represents typical arid and semi-arid villages in Gujarat. In terms of economic diversification, other occupations are service sector particularly government services (4.3%), other private services (4.4%), trade (2%), and animal husbandry (2%). Variations in village level occupational diversification have been observed, however, they are not significant. Dehri village of Jambusar in South Gujarat districts of Bharuch is least diversified amongst all the selected villages. More than 92% households accounts for first three category of

occupations (see Table 2.4). It has been observed that those villages that are located near the towns of taluka head-quarter have shown sign of occupational diversifications.

Figure :2.3



Source: Field Survey, April/May 2006

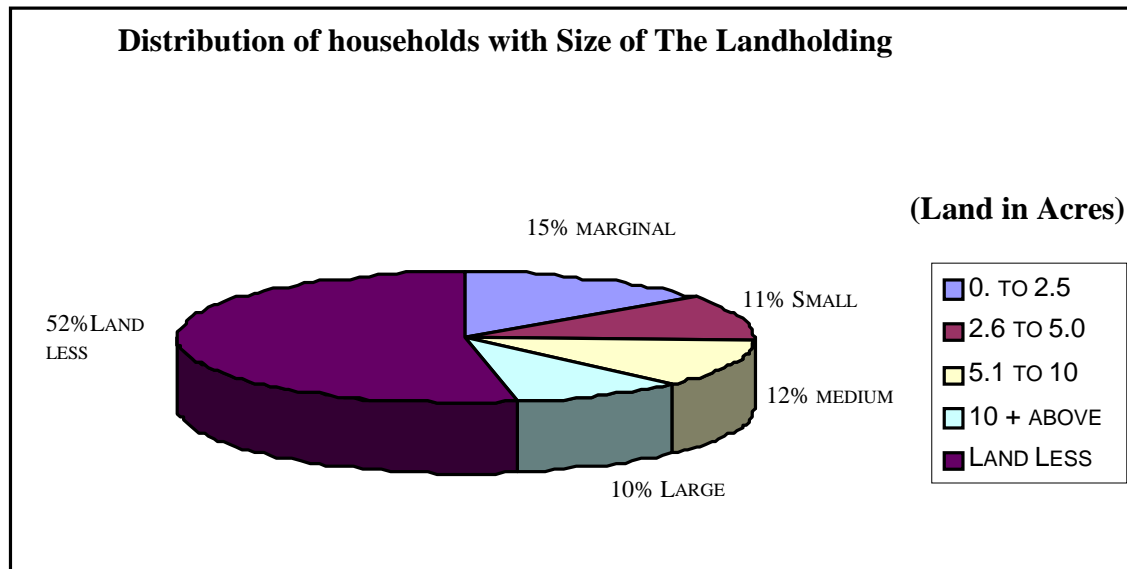
Therefore, inaccessibility and remoteness has been one of the major hurdles in diversification of occupation in drought regions of Gujarat. In short, all villages have shown poor diversification of economic activities due to lack of other avenues and poor non farm development. The entire population is more or less depends on agriculture and allied activities except a few which are either employed in government services or private services. These drought and drought prone villages are primarily engaged in agriculture sectors.

Distribution of Land-holding size in the villages

The size of land holding is generally found fairly distributed in arid and semi arid regions (See Table. 2.5). This has been found true in case of these villages, which have been surveyed in drought region of Gujarat. However, majority of households (about 53%) belongs to land less category in this region. The distribution of marginal farmers accounts for 15 % of the total household in the study area whereas small and medium farmers accounts for 11% and 12% respectively. Large farmers in the drought areas of Gujarat are 10%. Significant variations have been observed at village level in the distribution of the size of the land holdings. Landless households are as high as 80 % in Ankhi (Bharuch) followed by Dehri (70%) of Jambusar Taluka in Baruch districts. While Ankhi has reported comparatively diversified occupational structure, Dehri (Bharuch) has shown least diversification of economic activities. Other villages showing comparatively lower landless households are Limbala in Banaskantha and Malondha in Junagadh each registering a 30% of their households as landless. Comparatively large farmers are dominating in their

numbers in Surendranagar and Banaskantha districts, which are under DDP areas. Hence land holding size is skewed in DDP villages as compared to that of the DPAP.

Figure : 2.4



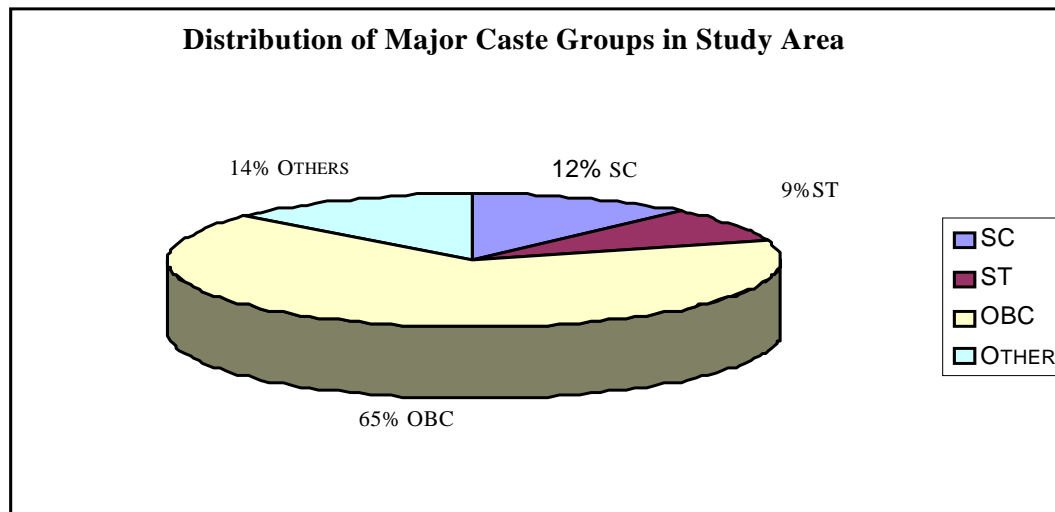
Source: Field Survey, April/May 2006

It has been observed that severity of impact of drought felt lesser with increasing landholding size in drought area of Gujarat (Chen, 1991). However, due to lack of external support either from state agencies or civil societies these villages have witnessed severe impact of drought during the last half a decade. The distribution of land holding are found to be fairly distributed amongst the major caste groups especially amongst OBCs in drought and drought prone villages in Gujarat (See Table 2.6 in Annexure). OBCs are dominating caste groups in terms of their land holdings in the study area.

Distribution of Major Caste Groups in Selected Villages

Table 2.7 shows the distribution of major caste groups in the drought prone villages in the state. The major dominating caste in terms of population is also OBCs which accounts for 66% of the total surveyed households. Other Households accounts for 14% followed by SC and ST with 12% and 9% of the total household surveyed. Villages level characteristics of DDP and DPAP areas in the state shows average to poor status of population. Caste composition of the sample villages in drought regions reflects state level pattern in true sense. Drought prone areas are to some extent also dominated by Other Backward Caste in numeric sense.

Figure: 2.5



Source: Field survey April/May 2006

Caste-wise distribution (See Table 2.8) of land holdings reveals that Other Caste is in a better position as compared to rest of them. Most vulnerable caste in terms of ownership of land is SC followed by ST in drought regions of Gujarat. The proportion of land less in these two caste groups has been found higher compared to other two caste groups.

Almost 53 per cent of the household surveyed is landless households in drought and drought prone regions of the state. The distribution of land holdings across the major caste groups reveals that number of households decreases with increasing landholdings except for Other-caste which are composed of so called higher caste. In case of Other caste the number of household also increases with increasing land holdings. It indicates that they are the better off groups in terms of distribution of landholdings as compared to other social groups in the study area. The skewed distribution of land holding and dominance of landless household in drought areas of Gujarat have resulted in very low household income. Information on income collected from surveyed households is not reliable as tendency of people is to hide their income so that they can avail various governmental benefits given to poor households.

Distribution of Landholdings and income

An attempt has been made to estimate average annual income of the surveyed household in this study. Table 2.9 shows average land holding size and estimated average annual income of all the households surveyed in each villages.

The average annual income of all the households is Rs. 22757.00 with an average land holding size of 3.55 acres of land in drought areas of Gujarat. The villages which are under DPAP areas have reported slightly higher annual income (Rs. 24553.00) per households compared to that of the villages in DDP areas (Rs.20880.00). This indicates the impacts of drought on income particularly agricultural income by reduced agriculture production and frequent crop failures. Significant variations have been observed in the distribution of household incomes across these villages. Limbala in Banaskantha (DDP) has reported lowest average annual income of Rs. 15755.00 while Malondha in Junagadh (DPAP)

registered highest average annual income per household of Rs. 31170.00. The low levels of household income in drought and drought prone areas of Gujarat, to make likely Then more vulnerable to natural disaster especially to drought. They would not be able to adopt appropriate coping strategies due to lack of financial support from their own sources. One easy coping strategies adopted by the rural population in this region is large out-migration of people in search of job. This is a striking characteristic of drought prone area and the extent of out-migration in search of job varies significantly across all the surveyed villages.

Out-migration in search of job

The drought prone areas of Gujarat have traditionally been an area of push factor for out-migration in search of employment and livelihood. Seasonal impact on livelihood pushes large chunk of population out of this area to augment their sources of livelihood. More than 17 per cent of the total household surveyed reported at least one family member out-migrating in search of a job to sustain life of their family members (See Table 2.10).

A significant variation has been absorbed in the percentage of out-migrating households in drought region. Both the villages in Surendranagar districts have reported exceptionally high percentage of households that out-migrates each year. The percentage of households that migrated last summer was 71% in Gangad and 44% in Kalam village of Surendranagar districts. It is noted that Surendranagar districts is one of the worst drought hit regions in Saurashtra. Ankhi (in Bharuch district) on the other hand reported only 3% of its households that migrates out of the villages in search of job. It is a noteworthy point that Ankhi has shown better economic diversifications which act as a pull factors for the people resulting in less cases of out-migration. In brief, it is observed that drought and drought prone areas of Gujarat especially DDP areas are the areas of out-migration. This characteristic of drought area poses serious regional planning challenges to planners and policy makers. The issues of impact of drought on migration have been dealt separately in a chapter to follow on Drought and Vulnerability. However, in addition to the poor diversification of economic activities, unequal land distribution, low income status, and large seasonal out-migration in drought prone regions, it has also suffered in terms of achievement of education.

The region is lagging behind from the rest of areas in state as well as in the country on account of literacy (See Table 2.11). While overall literacy rate in rural Gujarat is 62 per cent, only about 54 per cent of the total population (excluding 0-6 age groups) in the surveyed households is literate in drought and drought prone areas. In case of male literacy rate it is about 61 per cent while female literacy rate is as low as 46 per cent in the study area in Gujarat. There are significant variations in literacy rate across the surveyed villages. Ankhi (Bharuch district) is more diversified villages in terms of economic activities and is also most populous villages amongst those surveyed shows a better literacy rate for male (75%), female (62.12%), and total (69%) as compared to other villages. Overall total literacy rate is found lowest in Kansarvav (29%) in Panchmahal district followed by Dehri in Bharuch Districts. Male (36%) and Female (24%) literacy have also been found lowest in Kansarvav villages of Panchmahal district compared to other surveyed villages. The case of Ankhi and Dehri in Baruch districts reveals a significant impact of economic diversification and literacy in drought regions of the state. It has been generally observed that remote villages have shown low literacy rate in drought regions of Gujarat. These two districts are predominantly tribal where literacy is lower.

Villages Characteristics of drought regions in the state in terms of occupational diversity, size of the landholdings, distribution of major caste groups and levels of literacy have shown very poor status amongst the population. In short, drought and drought prone areas of Gujarat have been lagging far behind from the rest of the Gujarat which is a serious matter of concern for the planners and policy makers. However, the provisioning of basic facilities and infrastructure to these areas are taken care by the 'State' with slight variation at village level.

Rural Infrastructure and facilities- Physical and Social

The field visits and household survey conducted during last April/May 2006 in the 12 selected villages, reveals slightly better facilities of physical and social infrastructure in drought and drought prone areas of Gujarat. Table 2.12 shows availability of physical infrastructure and facilities in surveyed villages. All the villages have been accessible with all weather 'Pukka' roads with regular public transport facilities (Government Bus Service by the State Transport Department). The bus service is not regular in both the villages of Panchmahal districts. Frequency of bus services have been found two to four times in a day. All the surveyed villages are reported having regular supply of electricity. In terms of households having electricity connections, about 75 per cent of them reported metered electricity connections in their households. The percentage of electrified households varies between 52 per cent in Dehri (Junagadh) and 94 per cent in Badalpur (Junagadh) across these villages. Except for Suthari (Kutch) none of the villages have street lighting facilities. Thus, it has been observed that physical infrastructures in the villages are good in drought and drought prone area also.

Other rural facilities such as availability of fair price shop, flourmills and post office are either available inside the villages or nearby villages within a distance of 1-5 km (See Table 2.13). Means of communications i.e. telephone, television and radio available either public or private are found in each villages surveyed in drought and drought prone regions of Gujarat. However, social infrastructures and facilities are not found encouraging (See Table 2.14). Social infrastructures in terms of Anganwari, Primary schools are available in all the surveyed villages. Secondary schools were available in only in 4 villages out of the 12 we surveyed. Perhaps these villages do not meet the thresholds population in order to have secondary schooling facilities right in their villages.

Health facilities have been found less and services provided by the registered medical officer are very poor (See Table 2.15). All the surveyed villages reported availability of trained village nurse and her frequency of visit to the village is also found 2 to 4 times in a week. Kalam (Surendranagar) and Ankhi (Bharuch) reported availability of Family Health Centre and Primary Health Centre. They also reported qualified public and private doctors (medical practicers) visiting at least once in a week. No other medical facilities and services are reported from any of the surveyed villages.

Thus, it has been observed that villages in drought and drought prone regions of Gujarat are having sufficient physical infrastructures and facilities, however, educational and health facilities are not so encouraging. The issues of health and drinking water are somehow closely related in drought regions which needs a serious attention. The availability of drinking water and its related issues reveals striking features in these villages.

Issues of Drinking water: Availability, Adequacy and Quality

Problem of drinking water is acute in arid and semi arid regions all across the world so is the case of vast area of drought prone regions in Gujarat. The perpetual drought conditions and higher variations in rainfall in this region have created acute shortage of drinking water and have forced people to utilise even non-potable sources of water for drinking purposes. Table 2.16 shows seasonal sources of drinking water in surveyed villages in drought prone areas of Gujarat. Field survey data in 12 villages reveals a variety of drinking water sources with almost no seasonal variation. They are common well, village ponds, group schemes of tap water, Panchayat well and Panchayat tube well. Majority of the villages have group scheme of tap water supply in all three seasons, however, it has been observed during our field visit that they are poorly maintained and the supply are irregular. Both the villages in Surendranagar districts have well and ponds as their sources of drinking water.

Seasonal impact on the sources is not seen in the surveyed villages, however majority of villages have reported in-sufficient availability of drinking water from these sources during summer (See Table 2.17). Except in a village in Banaskantha all other villages have reported sufficient availability of drinking water during monsoon period, while 5 out of 12 villages surveyed reported in-sufficient drinking water during winter. Thus a significant seasonal impact has been observed on the sufficiency of drinking water in drought areas of Gujarat. The reduced availability of drinking water in summer results in poor quality of drinking water being consumed in some of the surveyed villages (See Table 2.18). Except in Badalpur in Junagadh district which has Panchayat tap water supply schemes, all other surveyed villages have either just ok or they manage with saline (salty drinking) water. Thus it has been observed that drought and drought prone areas in Gujarat suffers from the problems of drinking water in terms of a) unsafe sources b) poor quality and c) in-sufficient availability. They have also reported seasonal impact on availability and quality of drinking water. The issues of sources and availability of drinking water has been a matter of resource conservation of ground and surface water in the state. Drought prone regions suffer a lot on the ground of resource conservation and utilisations particularly water resources. Assessment of ground water in surveyed villages in this region reveals fast diminishing water table of ground water. Table 2.19 shows changes in levels of ground water in surveyed villages. All the villages have reported significant drop of water table except one or two villages where negative changes in the level of ground water are not so conspicuous. A detailed assessment of natural resource based on secondary data as well as field survey has been presented in the following chapter. The impact of droughts on drinking water at household level has also been dealt with in the next chapter.

Conclusions

Perpetual drought conditions and frequent occurrence of droughts on a large geographical area of Gujarat has resulted in many problems in these regions. It is evident that large area of the state has been covered under area development programme to deal with the associated problems of desertification and drought proneness. However, these areas suffer a lot on account of regular droughts that pose many serious problems to their population. The profile of drought regions reveals general backwardness and poor facilities. Though, there are good physical infrastructure facilities in the drought prone and remote villages, drinking water availability and quality poses serious problems to the people in these villages.

The household characteristics of these villages shown are not very encouraging on account of socio-economic development. They are economically less diversified, dominated by agricultural activities and have shown unequal land distribution amongst major caste groups. Distribution of landholding has been found skewed and majority of households are landless. One of the striking characteristics of drought areas is the large exodus of people out-migrating in search of job to sustain their life. It is also a reason of low income particularly income from agricultural sector. The level of literacy is very poor as compared to whole of rural Gujarat and there are large variations in literacy even amongst the surveyed villages. However, it has been observed that wherever there has been diversification of economic activities and those villages that are near to towns which are easily accessible, are comparatively better in terms of above mentioned characteristics.

The frequency as well as coverage of drought needs to be understood thoroughly at this point of time. The mitigation and management of drought affected areas need effective strategies to ensure drinking water supply through proper water resource management especially in drought regions. Scarcity related works are short term solution to this long term problem of perpetual droughts in the state. This phenomenon of perpetual drought condition in certain areas especially in Saurashtra and Kutch regions has lead to severe degradation and depletion of natural environment in the state.

Annexure: II

Table 2.1 Coverage of DPAP and DDP Area in Gujarat - 1981 TO 2001 (Area in Sq. km)

Year	Reported Area of Gujarat	Geographical Area under Area Development Programmes			Percentage of area to the total area of the state		
		DPAP	DDP	DPAP+DDP	DPAP	DDP	DPAP+DDP
1981	188220	55387	8736.1	64124	29.4	4.6	34.1
2001	188220	37375	60626	98000	19.9	32.2	52.1

Source: Revenue Department, Government of Gujarat

Table 2.2 Coverage of Area Development Programmed in Gujarat - 1981 TO 2001

Year	Total District	No. of Districts under			Total Taluka	No. of Talukas under		
		DPAP	DDP	DPAP+DDP		DPAP	DDP	DPAP+DDP
1981	19	8	2	10	184	43	8	51
2001	25	14	6	20	225	67	52	119
2005	25	14	6	20	225	67	52	119

Source: Revenue Department, Government of Gujarat

Table. 2.2a Coverage of Area Development Programmes in Gujarat under DPAP and DDP: Up till 2004

Sr.No	Districts	DDP		DPAP	
		No of Talukas	No of Projects	No of Talukas	No of Projects
DPAP Districts					
1	Ahmedabad	0	0	6	160
2	Amreli	0	0	11	344
3	Bharuch	0	0	4	137
4	Naramada	0	0	4	105
5	Bhavnagar	0	0	6	241
6	Junagadh	0	0	6	197
7	Porbandar	0	0	2	56
8	Panchamahals	0	0	10	293
9	Dahod	0	0	7	213
10	Sabarkantha	0	0	1	27
11	Vadodara	0	0	5	170
12	Dangs	0	0	1	53
13	Valsad	0	0	3	110
14	Navsari	0	0	1	43
DDP Districts					
15	Kachchh	10	59	0	0
16	Banaskantha	7	316	0	0
17	Patan	4	221	0	0
18	Rajkot	12	564	0	0
19	Surendranagar	10	487	0	0
20	Jamnagar	9	455	0	0
Non-DPAP+DDP					
21	Anand	0	0	0	0
22	Surat	0	0	0	0
23	Gandhinagar	0	0	0	0
24	Mehsana	0	0	0	0
25	Khed	0	0	0	0
Total		52	2642	67	2149

Source: Department of Revenue, Government of Gujarat, Gandhinagar

Table. 2.4 Occupational diversifications in Selected Villages in the Study Area

N=2758 Percentage of Households by Main occupation	Surendranagar		Kachchh		Banaskantha		Junagadh		Panchmahal		Bharuch		Gujarat, Drought Region
	Lakhtar		Abdasa		Vav		Veraval		Halol		Jambusar		
	Gangad	Kalam	Moti Sindhodi	Shuthar i	Jorava r gadh	Limbal a	Malondh a	Badalpu r	Kansar a vav	Khera p	Ankhi	Dehari	Grand Total
	DDP	DDP	DDP	DDP	DDP	DDP	DPAP	DPAP	DPAP	DPAP	DPAP	DPAP	
Agriculture	32.4	36.5	24.4	17.5	48.8	64.5	62.5	41.7	46.7	29.9	24.8	36.2	36.8
Agri. Laour	38.5	34.1	33.8	44.0	36.7	24.8	26.8	24.2	38.3	36.0	40.1	53.9	36.3
Rural Labour	12.1	7.8	3.8	9.5	1.6	3.7	2.7	11.4	2.8	22.0	9.7	2.0	7.7
Rural Artisan	0.0	0.6	0.0	0.3	2.3	0.8	0.0	4.7	0.0	0.0	0.0	0.0	0.7
Home work	1.6	1.8	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.2	0.0	0.3
Factory Worker	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.9	1.9	6.1	3.9	0.0	1.3
Trader	1.6	1.8	1.9	2.7	2.3	0.8	2.2	4.7	0.0	1.8	1.4	0.7	1.9
Gov. Service	0.0	6.6	11.3	5.3	2.0	3.7	1.8	1.4	0.9	1.2	8.1	2.6	4.3
Other Service	2.2	6.0	0.0	8.0	0.4	0.4	3.1	5.2	7.5	1.2	8.9	1.3	4.4
Animal Husbandary	9.9	3.0	6.3	0.8	2.3	0.8	0.4	2.4	1.9	0.0	0.0	0.7	1.9
Fishery	0.0	0.0	0.0	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
Other	1.6	1.2	18.8	6.4	3.5	0.4	0.4	2.8	0.0	1.8	2.9	2.6	3.6
Grand Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Field survey April/May 2006

Table 2.5. Percentage of households by size of the landholding in selected villages

N=2758	Surendranagar		Kachchh		Banaskantha		Junagadh		Panchmahal		Bharuch		Gujarat,
Land holding	Lakhtar		Abdasa		Vav		Veraval		Halol		Jambusar		Drought
Size (in Acres)	Gangad	Kalam	Moti	Shuthari	Joravar	Limbala	Malondha	Badalpur	Kansara	Kherap	Ankhi	Dehari	Region
			Sindhodi		gadhd				vav				Grand
	DDP	DDP	DDP	DDP	DDP	DDP	DPAP	DPAP	DPAP	DPAP	DPAP	DPAP	Total
0. to 2.5	7.69	5.39	5.63	6.90	12.50	6.61	23.66	23.70	29.91	74.39	6.20	7.89	14.76
2.6 to 5.0	4.40	4.79	15.63	14.32	15.63	20.66	16.07	12.32	4.67	3.66	6.20	5.92	10.84
5.1 to 10	23.08	15.57	12.50	7.43	18.36	24.38	26.34	9.00	0.93	2.44	3.88	2.63	11.93
10 + above	21.43	26.35	5.00	4.77	14.84	18.18	3.57	8.53	1.87	2.44	3.88	14.47	9.61
Land Less	43.41	47.90	61.25	66.58	38.67	30.17	30.36	46.45	62.62	17.07	79.84	69.08	52.86
Grand Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Field survey April/May 2006

Table. 2.6 Villages wise distribution of caste groups by their land holdings

Village Name	L_hold	SC	ST	OBC	Other	Total
Gangad	0. to 2.5	8		6		14
	2.6 to 5.0	1		7		8
	5.1 to 10	9		33		42
	10 + above			39		39
	No Land	27		51	1	79
	Total		45		136	1
Kalam	0. to 2.5	5			4	9
	2.6 to 5.0			2	6	8
	5.1 to 10	7		7	12	26
	10 + above	2		14	28	44
	No Land	44		25	11	80
	Total		58		48	61
Malondha	0. to 2.5	9		44		53
	2.6 to 5.0	5		31		36
	5.1 to 10	1	1	57		59
	10 + above			8		8
	No Land	12		56		68
	Total		27	1	196	
Badalpur	0. to 2.5	7		43		50
	2.6 to 5.0			26		26
	5.1 to 10			19		19
	10 + above			18		18
	No Land	34	2	62		98
	Total		41	2	168	
Moti Sindhodi	0. to 2.5	1		8		9
	2.6 to 5.0	1		23	1	25
	5.1 to 10	3		17		20
	10 + above			8		8
	No Land	2		92	4	98
	Total		7		148	5
Shuthari	0. to 2.5	3		22	1	26
	2.6 to 5.0	8		43	3	54
	5.1 to 10	2		16	10	28
	10 + above			12	6	18
	No Land	15	1	201	34	251
	Total		28	1	294	54
Joravargadh	0. to 2.5	5	5	17	5	32
	2.6 to 5.0	3	3	28	6	40
	5.1 to 10	1	5	36	5	47
	10 + above		1	24	13	38
	No Land	13	6	77	3	99
	Total		22	20	182	32
Limbala	0. to 2.5	6		8	2	16
	2.6 to 5.0	9		29	12	50

	5.1 to 10	3		41	15	59
	10 + above	1		29	14	44
	No Land	13		56	4	73
	Total	32		163	47	242
Kansaravav	0. to 2.5		11	21		32
	2.6 to 5.0		2	3		5
	5.1 to 10			1		1
	10 + above			2		2
	No Land		39	28		67
	Total		52	55		107
Kherap	0. to 2.5		38	84		122
	2.6 to 5.0		4	2		6
	5.1 to 10		2	2		4
	10 + above		1	3		4
	No Land		6	22		28
	Total		51	113		164
Ankhi	0. to 2.5	6	4	10	12	32
	2.6 to 5.0	1	2	10	19	32
	5.1 to 10		2	7	11	20
	10 + above		4	4	12	20
	No Land	49	25	246	92	412
	Total	56	37	277	146	516
Dehari	0. to 2.5		5	6	1	12
	2.6 to 5.0		4	3	2	9
	5.1 to 10		1	1	2	4
	10 + above		2	8	12	22
	No Land	5	64	22	14	105
	Total	5	76	40	31	152

Source: Field survey April/May 2006

Table . 2.7 Percentage distribution of major caste groups in selcted villages of Study Area

Caste groups	Surendranagar Lakhtar		Kachchh Abdasa		Banaskantha Vav		Junagadh Veraval		Panchmahal Halol		Bharuch Jambusar		Gujarat, Drought Region Total
	Gangad	Kalam	Moti Sindhodi	Shuthari	Joravar gadh	Limbala	Malondha	Badalpur	Kansara vav	Kherap	Ankhi	Dehari	
	DDP	DDP	DDP	DDP	DDP	DDP	DPAP	DPAP	DPAP	DPAP	DPAP	DPAP	
SC	24.73	34.73	4.38	7.43	8.59	13.22	12.05	19.43	0.00	0.00	10.85	3.29	11.64
ST	0.00	0.00	0.00	0.27	7.81	0.00	0.45	0.95	48.60	31.10	7.17	50.00	8.70
OBC	74.73	28.74	92.50	77.98	71.09	67.36	87.50	79.62	51.40	68.90	53.68	26.32	65.99
Other	0.55	36.53	3.13	14.32	12.50	19.42	0.00	0.00	0.00	0.00	28.29	20.39	13.67
Grand Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Field survey April/May 2006

Table 2.8 Percentage household of Major Caste Groups by their landholdings

Size of holdings (in Acres)	SC	ST	OBC	Other	Total
0. to 2.5	15.58	26.25	14.78	6.63	14.76
2.6 to 5.0	8.72	6.25	11.37	13.00	10.84
5.1 to 10	8.10	4.58	13.02	14.59	11.93
10 + above	0.93	3.33	9.29	22.55	9.61
No Land	66.67	59.58	51.54	43.24	52.86
Total	100.00	100.00	100.00	100.00	100.00

Source: Field survey April/May 2006

Table 2.9 Average size of the holding and annual income of the household in the Study Area

District Name	Name of Taluka	Name of Village	DPAP / DDP Village	No. of House holds	Average Land holdings	Average Annual Income (Rs.)
Surendranagar	Lakhtar	Gangad	DDP	31	8.41	19935.48
		Kalam	DDP	31	6.05	27483.87
Kutch	Abadasa	Moti Sindhodi	DDP	30	2.47	22071.43
		Shuthari	DDP	73	1.75	19863.01
Banaskantha	Vav	Joravargadh	DDP	53	4.79	20173.08
		Limbala	DDP	49	4.30	15755.10
Average annual household income of			DDP	267		20880.33
Junagadh	Veraval	Malondha	DPAP	41	4.34	31170.73
		Badalpur	DPAP	40	2.38	21600.00
Panchmahal	Halol	Kansaravav	DPAP	23	1.26	23434.78
		Kherap	DPAP	31	1.59	16733.33
Bharuch	Jambusar	Ankhi	DPAP	97	2.47	26480.41
		Dehari	DPAP	31	5.73	27900.00
Average annual household income of			DPAP	263		24553.21
Total				530	3.55	22757.33

Source: Field survey April/May 2006

Table 2.10 Status of Migration in Selected Village-2006

Sr. No	Village Name	No. of HH reported out-migration	No. of H.H. reported not migrating	Total
1	Gangad	70.88	29.12	100.00
2	Kalam	44.17	55.83	100.00
3	Malondha	24.66	75.34	100.00
4	Badalpur	20.11	79.89	100.00
5	Moti Sendhodi	11.88	88.13	100.00
6	Suthari	5.84	94.16	100.00
7	Limbala	10.33	89.67	100.00
8	Joravargadh	8.98	91.02	100.00
9	Kansaravav	16.82	83.18	100.00
10	Kherap	23.78	76.22	100.00
11	Daheri	11.18	89.47	100.00
12	Ankhi	3.10	96.90	100.00
Total		17.30	82.73	100.00

Source: Field survey April/May 2006

Table 2.11 Levels of Education in Selected Villages in the study area

Districts	Taluka	Village	DPAP / DDP Village	% Illiterate			% Literates		
				Male	Female	Total	Male	Female	Total
Surendranagar	Lakhtar	Gangad	DDP	48.19	64.97	55.92	51.81	35.03	44.08
		Kalam	DDP	34.13	50.17	42.23	65.87	49.83	57.77
Kachchh	Abdasa	Moti Sindhodi	DDP	38.89	44.87	41.08	61.11	55.13	58.92
		Suthari	DDP	31.75	50.00	40.65	68.25	50.00	59.35
Banaskantha	Vav	Joravargadh	DDP	44.12	51.65	47.25	55.88	48.35	52.75
		Limbala	DDP	35.29	58.48	46.92	64.71	41.52	53.08
Junagadh	Veravad-Patan	Malondha	DPAP	37.59	51.28	44.36	62.41	48.72	55.64
		Badalpur	DPAP	39.60	53.76	46.39	60.40	46.24	53.61
Panchmahal	Halol	Kansaravav	DPAP	64.31	76.45	70.53	35.69	23.55	29.47
		Kherap	DPAP	50.51	70.55	60.29	49.49	29.45	39.71
Bharuch	Jambusar	Anakhi	DPAP	25.48	37.88	31.14	74.52	62.12	68.86
		Dahari	DPAP	61.98	78.13	69.74	38.02	21.88	30.26
Total				39.21	54.07	46.18	60.79	45.93	53.82

Source: Field survey April/May 2006

Table 2.12 Physical Rural Infrastructure in Selected Villages

District	Taluka	Village	DPAP / DDP Village	All weather Road Yes- 1, No-2	Regularity of Service, Yes -1, No -2	Frequency No. of times/day	Regular Electricit Supply, Yes-1, No -2	Electricity in HH	Street Lights	Total HH Listing	% HH electrified
Surendranagar	Lakhtar	Gangad	DDP	1	1	2	1	122	0	182	67.0
		Kalam	DDP	1	1	2	1	145	0	167	86.8
Kachchh	Abdasa	Moti Sindhodi	DDP	1	1	4	1	125	0	160	78.1
		Suthari	DDP	1	1	4	1	310	1	377	82.2
Banaskantha	Vav	Joravargadh	DDP	1	1	2	1	180	0	256	70.3
		Limbala	DDP	1	1	1	1	200	0	242	82.6
Junagadh	Veravad- Patan	Malondha	DPAP	1	1	2	1	120	0	223	53.8
		Badalpur	DPAP	1	1	2	1	200	0	213	93.9
Panchmahal	Halol	Kansaravav	DPAP	1	0	0	1	80	0	107	74.8
		Kherap	DPAP	1	0	0	1	110	0	164	67.1
Bharuch	Jambusar	Anakhi	DPAP	1	1	0	1	400	0	516	77.5
		Dehari	DPAP	1	1	4	1	80	0	152	52.6
Total								2072		2759	75.1

Source: Field survey April/May 2006

Table 2.13 Availability of Other Rural Facilities in Selected Villages

District	Taluka	Village	DPAP /Fair Price DDP shop, Village within Village-1, Outside Village-2	Flour mill,within Village-1, Outside Village-2	Post Office,within Village-1, Outside Village-2	Tele phone, Private- Public- 2,	Tele vision, Private- Public- 2,	Radio, Private- Public- 2,	
Surendranagar	Lakhtar	Gangad	DDP	2	1	2	1	1	1
		Kalam	DDP	2	1	1	1	1	1
Kachchh	Abdasa	Moti Sindhodi	DDP	1	1	1	1	1	1
		Suthari	DDP	1	1	1	1	1	1
Banaskantha	Vav	Joravargadh	DDP	1	1	1	1	1	1
		Limbala	DDP	1	1	2	1	1	1
Junagadh	Veravad-Patan	Malondha	DPAP	2	2	2	1	1	1
		Badalpur	DPAP	1	1	2	1	1	1
Panchmahal	Halol	Kansaravav	DPAP	2	2	2	1	1	1
		Kherap	DPAP	2	1	2	1	1	1
Bharuch	Jambusar	Anakhi	DPAP	1	1	1	1	1	1
		Dehari	DPAP	1	1	2	1	1	1

Source: Field survey April/May 2006

Table 2.14 Social – Infrastructure Educational Facilities in Selected Villages

District	Taluka	Village	DPAP / DDP Village	Anganvadi	Primary (1-7 Std.)	Secondary (8-10 Std.)	Higher secondary (above 10 Std.)	Total Pop	Total HH Listing
Surendranagar	Lakhtar	Gangad	DDP	1	1	0	0	923	182
		Kalam	DDP	1	1	0	0	936	167
Kachchh	Abdasa	Moti Sindhodi	DDP	1	1	1	0	760	160
		Suthari	DDP	1	1	1	0	1997	377
Banaskantha	Vav	Joravargadh	DDP	1	1	1	0	1558	256
		Limbala	DDP	1	1	0	0	1933	242
Junagadh	Veravad-Patan	Malondha	DPAP	1	1	0	0	1309	223
		Badalpur	DPAP	1	1	0	0	1430	213
Panchmahal	Halol	Kansaravav	DPAP	1	1	0	0	551	107
		Kherap	DPAP	1	1	0	0	906	164
Bharuch	Jambusar	Anakhi	DPAP	1	1	1	0	2508	516
		Dehari	DPAP	1	1	0	0	950	152
Total								15761	2759

Source: Field survey April/May 2006

Table 2.15 Health Facilities in Selected Villages

District	Taluka	Village	DPAP / DDP Village	Availability of Village Nurse. Yes-1, No-2	Visit of Village Nurse/Week	Family Health Centre Yes-1, No-2	PHCs, Yes-1, No-2	Private Doctors (MBBS)	Visit of doctor/week	Any Other Health Facilities
Surendranagar	Lakhtar	Gangad	DDP	1	4	0	0	0	0	0
		Kalam	DDP	1	3	1	1	1	1	0
Kachchh	Abdasa	Moti Sindhodi	DDP	1	4	0	0	0	0	0
		Suthari	DDP	1	4	0	0	0	0	0
Banaskantha	Vav	Joravargadh	DDP	1	2	0	0	0	0	0
		Limbala	DDP	1	4	0	0	0	0	0
Junagadh	Veravad-Patan	Malondha	DPAP	1	4	0	0	0	0	0
		Badalpur	DPAP	1	4	0	0	0	0	0
Panchmahal	Halol	Kansaravav	DPAP	1	4	0	0	0	0	0
		Kherap	DPAP	1	2	0	0	0	0	0
Bharuch	Jambusar	Anakhi	DPAP	1	4	1	1	1	5	0
		Dehari	DPAP	1	2	0	0	0	0	0

Source: Field survey April/May 2006

Table 2.16 Status and Availability of Drinking water in Selected Villages

District	Taluka	Village	DPAP / DDP Village	Source of Drinking water in Monsoon	Source of Drinking water in Winter	Source of Drinking water in Summer
Surendranagar	Lakhtar	Gangad	DDP	1	1	1
		Kalam	DDP	2	2	1
Kachchh	Abdasa	Moti Sindhodi	DDP	4	4	4
		Suthari	DDP	3	3	3
Banaskantha	Vav	Joravargadh	DDP	3	3	3
		Limbala	DDP	3	3	3
Junagadh	Veravad-Patan	Malondha	DPAP	4	4	4
		Badalpur	DPAP	3	3	3
Panchmahal	Halol	Kansaravav	DPAP	5	5	5
		Kherap	DPAP	5	5	5
Bharuch	Jambusar	Anakhi	DPAP	3	3	3
		Dehari	DPAP	3	3	3
Code : Well=1 Pond=2		Group Scheme tap water=3	Panchayat well =4	Panchayat tube =5		

Source: Field survey April/May 2006

Table 2.17 Seasonal Availability of Drinking water in Selected Villages

District	Taluka	Village	DPAP / DDP Village	Extent of Availability in Monsoon	Extent of Availability in Winter	Extent of Availability in Summer
Surendranagar	Lakhtar	Gangad	DDP	1	1	2
		Kalam	DDP	1	2	0
Kachchh	Abdasa	Moti Sindhodi	DDP	1	1	1
		Suthari	DDP	1	1	2
Banaskantha	Vav	Joravargadh	DDP	2	2	2
		Limbala	DDP	2	2	2
Junagadh	Veravad-Patan	Malondha	DPAP	1	2	2
		Badalpur	DPAP	1	2	2
Panchmahal	Halol	Kansaravav	DPAP	1	1	1
		Kherap	DPAP	1	1	1
Bharuch	Jambusar	Anakhi	DPAP	1	1	1
		Dehari	DPAP	1	1	1

Note: 0=Not Available, 1= Sufficient, 2= Not Sufficient

Source: Field survey April/May 2006

Table 2.18 Seasonal Change in quality of drinking water

District	Taluka	Village	DPAP / DDP Village	Drinking water in Monsoon	Drinking water in Winter	Drinking water in Summer
Surendranagar	Lakhtar	Gangad	DDP	2	3	3
		Kalam	DDP	1	2	3
Kachchh	Abdasa	Moti Sindhodi	DDP	1	2	2
		Suthari	DDP	1	2	3
Banaskantha	Vav	Joravargadh	DDP	2	2	2
		Limbala	DDP	2	2	2
Junagadh	Veravad-Patan	Malondha	DPAP	2	3	3
		Badalpur	DPAP	1	1	1
Panchmahal	Halol	Kansaravav	DPAP	2	2	2
		Kherap	DPAP	2	2	2
Bharuch	Jambusar	Anakhi	DPAP	2	2	2
		Dehari	DPAP	2	2	2

Note 1- Potabale, 2- OK, 3- Potable but salty

Source: Field survey April/May 2006

Table 2.19 Change in the Status of Natural Resources in Last 20 Years

District	Taluka	Village	DPAP / DDP Village	Level of ground water table (in Feet)		
				At present	10 years ago	20 years ago
Surendranagar	Lakhtar	Gangad	DDP	100	60	30
		Kalam	DDP	30	20	20
Kachchh	Abdasa	Moti Sindhodi	DDP	60	30	20
		Suthari	DDP	150	100	30
Banaskantha	Vav	Joravargadh	DDP	100	60	40
		Limbala	DDP	25	25	30
Junagadh	Veravad-Patan	Malondha	DPAP	100	60	30
		Badalpur	DPAP	30	20	15
Panchmahal	Halol	Kansaravav	DPAP	300	150	80
		Kherap	DPAP	150	80	45
Bharuch	Jambusar	Anakhi	DPAP	120	100	80
		Dehari	DPAP	30	30	30

Source: Field survey April/May 2006

Chapter Three

Droughts and Natural Resources

Chapter Three

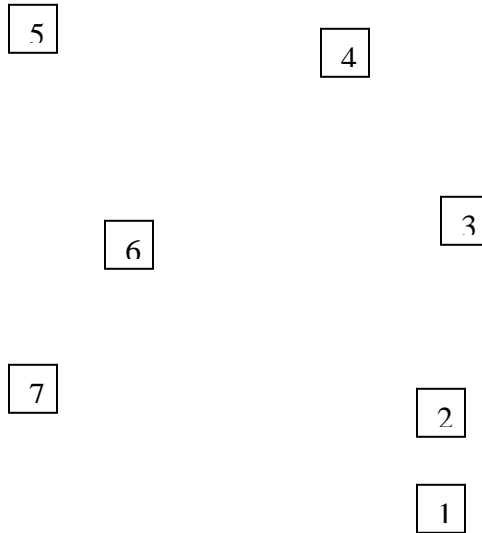
DROUGHTS AND NATURAL RESOURCES

Introduction

As defined in the previous chapter, droughts are natural weather anomalies and if they go un-noticed create natural disaster. The types of drought may vary in time and space. Gujarat is predominantly arid and semi-arid area in terms of prevailing climatic conditions. Large areas are under desert and drought prone which poses serious problems of resource conservation both at meso and micro level. The perpetual drought condition and its frequent occurrence impact population as well as available natural resources in a particular area. Drought conditions result in depletion and degradation of natural resources such as water, land and forest cover. A brief note on the overall environmental characteristics of the State is worth mentioning before we examine impacts of droughts on natural resources available to the people in drought and drought prone regions in Gujarat.

Gujarat is the 5th largest state in India in terms of total geographical area. It shares 5.96 percent of total geographical area of the country with a total population of 50.59 million. Most striking environmental feature of Gujarat State is that 50% of its total geographical areas are either desert or drought prone. Man land pressure in term of density of population in the state is 258 (Census, 2001). Gujarat has largest coastline of 1600 km among main land state of India. Overall environment of Gujarat is the combined function of its topography, soil, vegetation and climatic conditions prevailing in the state. The physiographic division of state depicts wide variation in these factors over space in the state. It has been divided into 5 regions namely - North Gujarat, Central and South Gujarat, Eastern Tribal Belt, Saurashtra and Kutch regions. Further it has been divided into seven sub-regions based on the agro climatic features of soil type, topography and climate (See Table 3.1 and Figure 3.1 in Annexure). The drought and drought prone areas are spread over all the agro-climatic regions in the state. The following discussion will focus on the status of natural resources in terms of land use, water (drinking) and forest in both DDP and DPAP areas. The changes over time in these resources are also assessed in this chapter. The impact of droughts on various issues of drinking water at household level is also examined. Village level status of ground water and changes over time has also been assessed in this chapter.

Figure 3.1 Agro-climatic regions in Gujarat

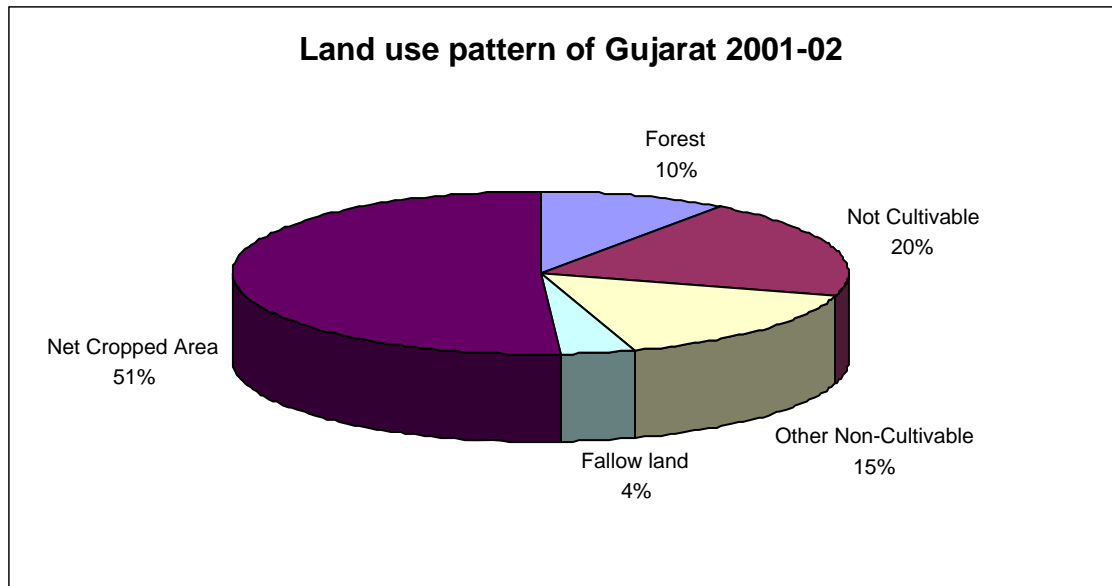


The status of Environment: Land Use and Changes over time

Status of Land Utilisation

The utilisation of available land as resources depends on their qualities that are highly influenced by the prevailing climatic conditions in a particular region. High cost technology may use even non-cultivable land; however the scale of operation will determine the overall land use pattern. It has been observed world wide that arid and semi-arid regions traditionally suffer on account of low rainfall which restricts gainful utilisation of land as an agriculture resources. However, not all the land available is suitable for agriculture purposes. Overall land use pattern of the state reflects the prevailing environmental conditions in Gujarat.

Figure 3.2



Source: Department of Agriculture, Government of Gujarat, Gandhinagar

The overall land use pattern of the state shows less favourable utilisation of land under agriculture (See Fig.3.1 and also Table 3.2). Only about 51 per cent of its total utilisable land areas are net cropped area, while total forests cover area accounts for only 10% of its total land area. About 35% areas are either not suitable for cultivation or under cultivable waste. This includes a small percentage (5%) of permanent pasture and grazing land. Gujarat is predominantly agricultural society where significant portion of population heavily depends on livestock and animal husbandry. Pressure of livestock on this meagre pasture and grazing land is a serious environmental problem related to drought and drought prone regions.

Land use Change: 1971-72 to 2001-02

The overall land use pattern has shown very little changes in Gujarat with fewer variations at regional levels. Table 3.2 explains the land use classification in the state over time. The following inferences can be made from the pattern of land use:

- A) There has been marginal decline in net shown area in the state. Its share has decline from 51.88% in 1971-72 to 51.15% in 2001-02 in relative terms in total area of the state. However, there has been a total loss of 1404 sq. km net shown areas in the state during the last 3 decades.
- B) The increase shown in the gross cropped areas is largely due to the increase in the areas shown more than once, however, the scale of operation has not been able to make significant increase in cropping intensity of the state during the same period.
- C) The cropping intensity has shown increase during the first decade of analysis. It has increase from 108 to 122 during 1971-72 to 1981-82. It has further shown a declining trend from 1981-82 onwards and has reached to 111 in 2001-02.

- D) A similar trend has been observed in case of forest cover in the state.
- E) There has been decline in the un-cultivable land on the one hand and on the other the fallowing both current and other fallow has shown increasing trends during the same period.
- F) The total land not available for cultivation remained almost unchanged, however, other cultivable land including cultivable waste has shown decline during the last three decades.
- G) This indicated that there has been low potential for development of net shown area due to lack of irrigation where as the pressure of agricultural waste land shown increasing trends.
- H) The overall land use pattern of the state shows a poor land utilisation (particularly for agriculture purposes) as far as the environmental consequences are concerned.

The scope of this chapter does not allow a discussion on this issue at present. It has been dealt in the following chapters on Droughts and Agriculture. However, land utilisations under agriculture purposes are discussed below.

Total Cropped Area and Cropping Intensity in Drought Prone area

The scenario of cropped area is not very encouraging in Gujarat. The gross cropped areas accounts for 57% of the total utilisable land, while area shown more than once is only about 6%. The share of these areas further declines in both DDP and DPAP regions of Gujarat (See Table 3.2). This attributed to the fact that there is very less potential of assured irrigation for taking two crops in year in DDP and DPAP districts than in Other districts of the state. The overall cropping intensity works out to be 112, which is far below the national average of 122. This further shows a lower status both in DDP and DPAP areas in Gujarat. In short DDP and DPAP areas are lagging far behind in land utilisation for agriculture purposes due to the severity and perpetually of droughts.

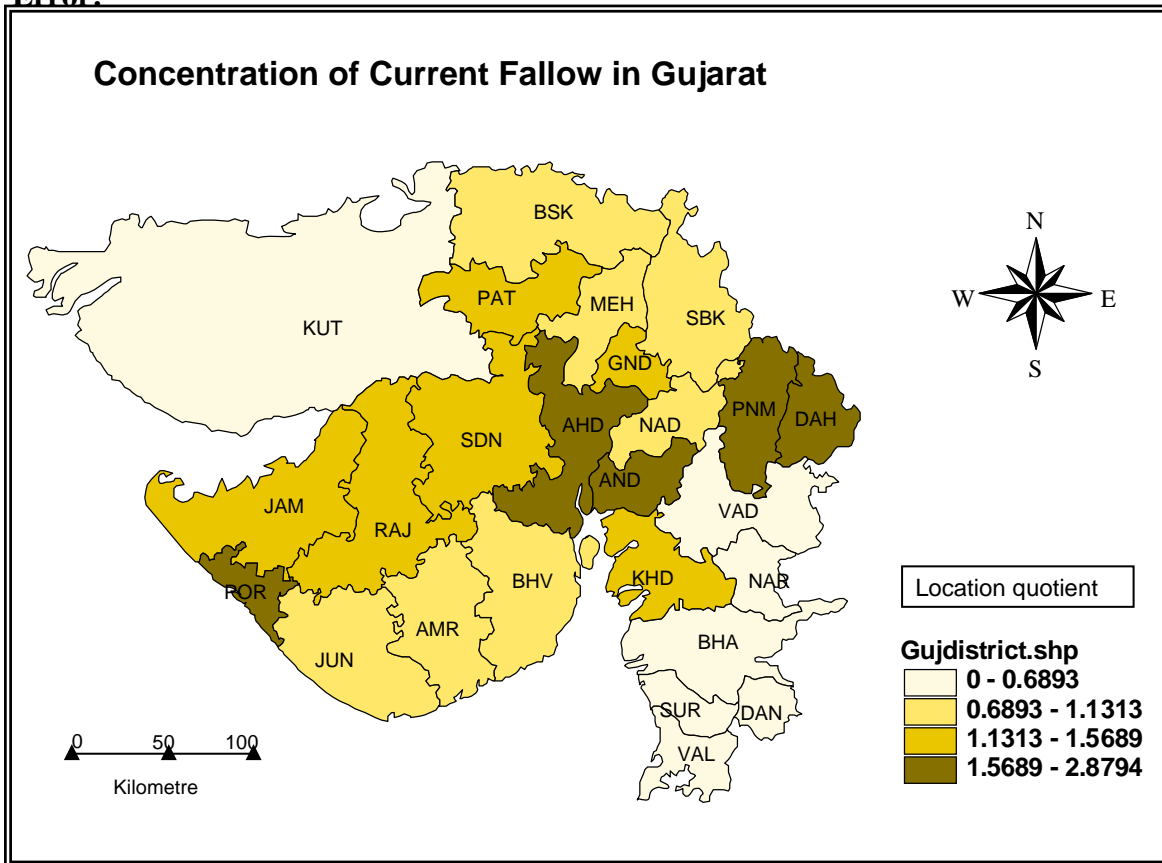
Fallow Lands

Fallow land, which is dominated by the current fallows, accounts for 4% of its total land area in the state. Their percentage increases in DPAP as well as in Non- DPAP and DDP area due to lack of assured irrigation. However, DDP area reported comparatively lower fallow lands. This is obvious as agriculture practices are intense in these are to increase the production and yield for food security. It should be noted that agriculture practices in DDP are at subsistence level, hence it shows a lower fallowing.

The concentration of fallow lands in terms of location quotient has been shown in the Figure 3.2. Districts level concentration of fallow lands shows higher concentration in either Non-DPAP/DDP districts or in the DPAP districts. Some of the districts of DDP area i.e. Patan, Surendranagar, Rajkot and Jamnagar have shown moderate concentration of fallowing. The lower percentage of fallow lands in DDP districts is the effects of very low fallowing in Kutch. This is a serious environmental concerned as the pressure on land for agriculture purposes are more in DDP areas than in the others. Current fallowing helps rejuvenate the productivity of agriculture land and helps in pastoral activities for rural population.

Figure 3.2

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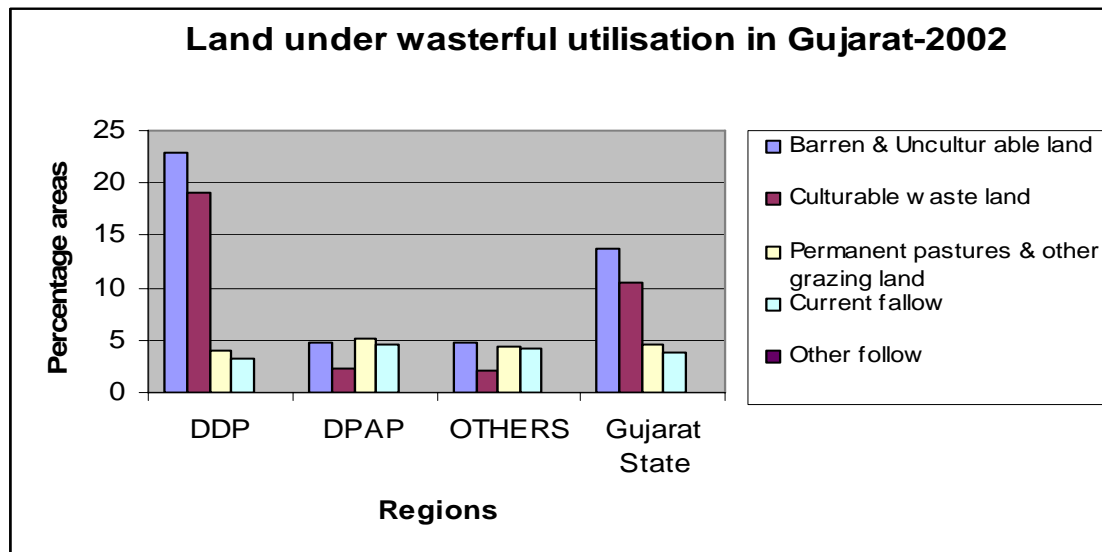
Data Source: Directorate of Agriculture, Government of Gujarat, Gandhinagar

Thus, the environmental constraints in terms of utilizable land resources are more in drought and drought prone areas in the state than that of the others.

Land utilization: Status and change over time

Table 3.3 Shows land under wasteful use in Gujarat. Gujarat accounts for 33% of its total utilizable land under wasteful use in the year 2001-02. The share of Barren land was 14 % while almost 11 % of its total land area was reported under Cultivable Waster land. Only about 5% of its total land is Permanent Pasture and Grazing land. Current fallow land accounts for about 4 % of its total land. Significant variations have been observed in drought and drought prone areas as far as the land under wasteful uses are concerned. 49% of the total areas of DDP district were under wasteful uses followed by 17% in

Figure 3.3



Data Source: Directorate of Agriculture, Government of Gujarat, Gandhinagar

DDAP and 15 % in other districts. Out of 49% of land under wasteful use in DDP districts, 42% of that are reported either Barren and Uncultivable land or Cultivable waste land, followed by permanent pasture and grazing land (4%) and follow land (3.30%). The distribution of land under wasteful uses is comparatively less in DPAP and other districts of the state. DPAP areas account for only about 17% of land under wasteful use, while rest of the districts reported 15.49% of its total land under wasteful category. These lands are fairly distributed under different uses both in DPAP and other areas. Thus, the environmental impacts for land utilization have been observed more in case of DDP areas / region than those of DPAP and Others.

Changes over time in the land under wasteful use

Table 3.3 shows changes in wasteful land use categories amongst different regions in Gujarat during the last two decades. The following inferences can be drawn from the data.

- The decadal changes in the initial decade show an increase in land under wasteful use in both DDP and DPAP areas, while marginal decline has been observed in those of other areas of the state.
- Sharper decline has been observed during 1981-82 and 2001-02 in all the categories of land under wasteful use in DDP and DPAP areas in the state. However, the decline in land under wasteful category in DPAP is striking. This has been attributed to transfer of DPAP area into DDP during 1995-96 after the recommendation of Hanumantha Rao Committee.
- Rest of the areas, other than DDP and DPAP has shown stagnation in the various categories of land under wasteful uses. There has been marginal increase in land under wasteful categories in these areas due to following (current fallow). The Barren and Uncultivable land has also registered a steady increase in this region.

- d) The changes in wasteful land category indicate the extent of stress on land by anthropogenic pressure especially in DDP and DPAP areas of the state.
- e) Environmental constraints of drought and drought proneness have not been overcome by the technological inputs so far in these areas. The required inputs such as assured irrigations and institutional arrangement for appropriate land use planning have been lacking in the state.

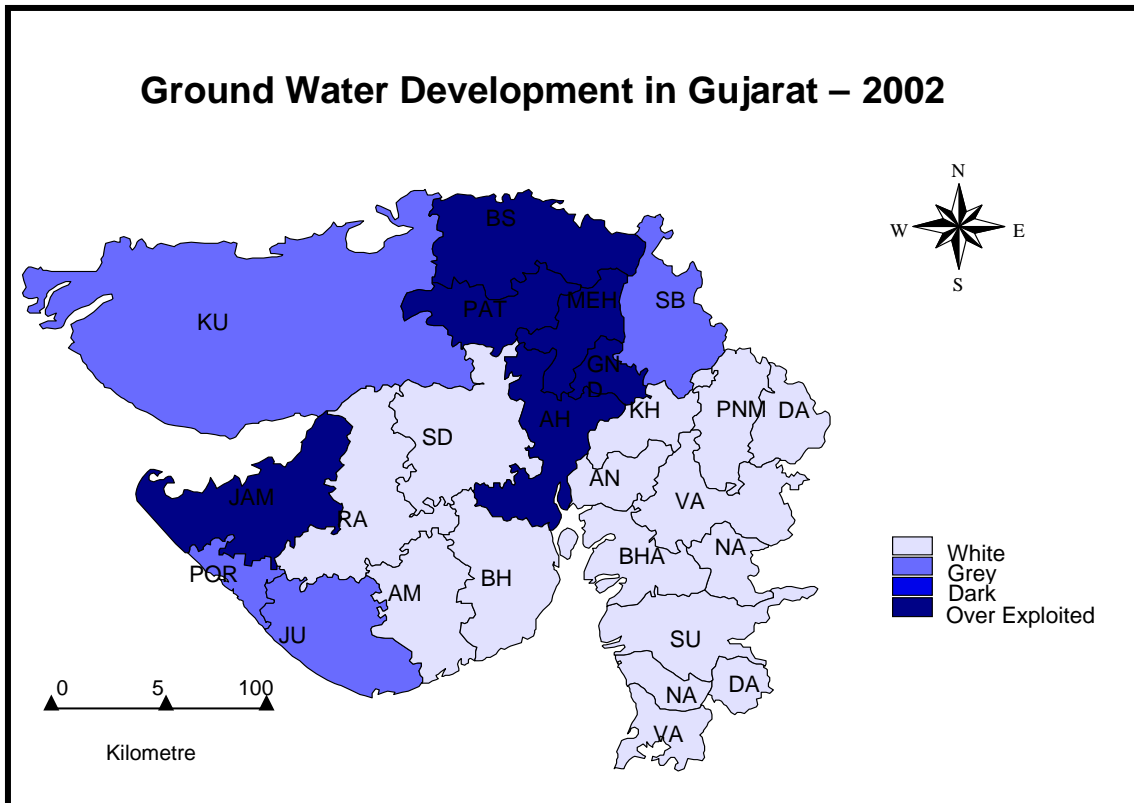
Thus the status of land utilisation in Gujarat for agriculture has not been encouraging due to environmental constraints and lack of institutional mechanism. Environmental constraints in terms of frequent droughts have put serious problems for land utilization. Land utilization shows striking variations across the various regions in the State. Overall decline in Net Shown Area (NSA) is a not healthy indication of already deteriorating agriculture (conditions). Cropping intensity has been very low in the state, while DDP and DPAP areas registered further lower cropping intensity. In short agriculture development in terms of NSA and cropping intensity has suffered due to regular drought in the state. DDP regions are worst affected area in this regards. Environmental constraints have not only been evident in case of land development and utilization, but also in the levels of ground water development in the state.

Levels of Ground water Development: Status and change over time.

Table 3.4 shows the number of talukas under each categories of ground water development across DDP, DPAP and rest of the Others districts in 1991, 1997 and 2004. Central ground water commission categorises talukas based on the levels of ground water developments in terms of White, Grey, Dark, Over Exploited and Saline. The methods of categorization has been dealt in averseness one.

The present status of levels of ground water development in the state shows alarming signals of deteriorating ground water scenario. Out of 225 talukas only 85 are white taluka i.e. safe in terms of good ground water development, 80 are in grey category i.e. in semi-critical stage of ground water development. 13 talukas are under critical category (Dark), while 31 talukas are put under over exploited category. 14 talukas of the state are saline due to coastal influence of salinity ingress due to over draft of sweet water on the coast. Out of this 14 taluka, 11 are in DDP taluka, remaining 3 are in DPAP talukas. Therefore, ground water salinity is concentrated in drought and drought prone areas of the state.

Figure: 3. 4



Out of 85 talukas which are reported to be white taluka (“Show map to Ground water Development”) i.e. safe ground water development, only 14 talukas belongs to DDP areas, white DPAP talukas are 51 and rest other taluka accounts for 20 in this category, Grey (semi-critical) talukas are also dominated by DPAP areas where 47 talukas are under grey category, 22 are under DDP and 11 are in others taluka. Out of 13 Dark (critical) talukas, 4 belong to DDP and 7 to DPAP districts, only 2 talukas are there in rest of the area of Gujarat. However, over exploited talukas in Gujarat are 31, of which 12 each belong to DDP and Other area, while 7 belong to DPAP. In short, the ground water development in the state is very poor in DDP talukas compared to DPAP and Others. Thus, the status of ground water development in the state is showing alarming signals of deteriorating situations.

The status of ground water development has been fast deteriorating in the state. During 1991 and 2004, the levels of ground water development across desert and drought prone areas have been deteriorating fast (See Table 3.4). There were altogether 123 talukas in white category i.e. in safe ground water development, which reduced to 97 in 1997 and they further reduced to 85 in 2004. Similar reduction in safe talukas has been noticed in case of Other (Non DDP and DPAP) talukas. They were 61, 45 and 20 in 1991, 1997 and 2004 respectively. However, DDP and DPAP talukas have registered slight improvement in white talukas in 2004. There were only 7 talukas in white category in 1991, which reduced to 3 in the year 1997 across DDP areas. But it had consolidated in 2004, with 14 talukas coming in-to white category. However, this is not the gloomy picture about drought and drought prone area of Gujarat. There has also been increase in the member of

talukas in Grey, Dark, OE and Saline categories during the same period. To sum up, it is evident that drought prone and desert areas of Gujarat have poor status of ground water development. This is attributed to the fact that arid and semi-arid regions experiences gross loss of surface and ground water due to deficit precipitation, as evapotranspiration exceeds precipitation in these regions. This has lead to perpetual and frequent occurrence of drought in these areas of the state.

Further the diminishing and deteriorating ground water development gets its confirmation at village level as the supply of drinking water gets badly affected during drought period. Seasonal impact of drought on drinking water has already been discussed in previous chapter with the help of field survey at village level in DDP and DPAP villages. We present field level data in regards to effects of drought on drinking water at HH level in drought and drought prone villages in the state.

Adequacy of Drinking Water

Table 3.5 shows the impact of drought on drinking water at HH level in DDP and DPAP villages. Out of 530 HH surveyed, 260 HH in DDP villages and 256 in DPAP villages reported having sufficient drinking water during monsoon in normal year, while same reduces to 196 in DDP and 220 in DPAP during monsoon season in a drought year. Hence even during monsoon period the supply of sufficient drinking water gets affected in drought year. Usual seasonal impact on adequacy of drinking water has also been observed, however, a striking impact is noticed between a normal and drought year.

During winter of a normal year 256 HH reported sufficient drinking water supply in all the 6 villages of DDP areas. Similar response has also been registered from DPAP villages, but during winter of drought year, 185 HH in DDP villages and 219 HH DPAP villages reported having sufficient drinking water supply from all sources. The case of summer of both normal and drought years looks very disappointing, 177 HH in DDP villages reported sufficient drinking water in normal summer season, where in a summer of drought year only 111 HH reported sufficient drinking water supply from all possible sources. In case of DPAP villages, the situation is slightly better at HH level compared to DDP villages during summer in normal and drought year. In short, it has been observed that seasonal impact of drought on drinking water at HH level in drought and drought prone areas of Gujarat has been prominent. The situation gets worsened during the drought period across the season and across DDP and DPAP regions. However, desert areas also face severe problem of drinking water quality from all sources in drought and drought prone areas in the state.

Quality of Drinking Water

The deteriorating and diminishing supply of water results in un-safe (poor quality) drinking water consumption in drought and drought prone regions of the state. The data provided by GWSSB, 2002 reveals a serious quality problem of drinking water across DDP and DPAP regions in the state in 2002. Table 3.6 shows the number of villages having degraded quality of water in terms of fluorides, TDS and Nitrate. Prevalence of poor quality drinking water has been observed in the villages across different regions of Gujarat. There are altogether 609 villages that have reported fluoride and TDS

concentration beyond permissible limit in their (drinking) water in the state. Out of these 276 belong to DPAP districts, whereas 176 villages have reported higher concentration of fluoride and TDS in DDP districts. 163 villages from rest of the other districts also reported these materials beyond permissible limits in their sources of drinking water. This indicates relatively poor quality of drinking water particularly in drought and drought prone areas compared to rest of the areas in the state.

In terms of TDS and Nitrate, again large number, of villages from DDP and DPAP areas reported higher concentration in drinking water. Out of 168 villages, which reported TDS and Nitrate concentration in Drinking Water beyond permissible limit, 119 villages belong to either DDP or DPAP districts. Similarly the number of villages with higher concentration of fluorides and Nitrate and all three combinations were higher in DPAP and DDP districts than rest of the districts. Thus, it has been observed that quality of drinking water is poor with many impurities particularly in drought and drought prone regions in Gujarat. The environmental constraint in drought and drought prone areas of Gujarat has resulted in degraded and diminishing water resources particularly drinking water. The impact of drought on land resources has also been observed as decreasing NSA poses serious problems of food security, particularly in drought and drought prone areas in Gujarat. Drought prone tribal areas of Gujarat has already witnessed problem of food security in Gujarat (Chatterji, & Dang, 2006). One of the serious ecological rather than environmental problems in drought and drought prone areas is in adequate forest cover and its degradation by human interference.

Status of forest cover in Gujarat

Table: 3.7 Shows status of forest cover across different area in Gujarat during 1991 and 2001. According to Forest Survey of India Report 2001, only 7.70% to the total areas of Gujarat is forest. However, the area under forest cover varies across DDP, DPAP and Other districts. Since, DPAP districts are wide spreads and covers even eastern and southern hilly areas of Gujarat, forest area covers 14.66% of its total area under DPAP districts. The rest of the districts i.e. Non-DDP and DPAP have also shown relatively better forest cover of 12% compared to DDP districts which accounts for only about 4% of forest area. This is quite obvious, in the sense that DDP areas of the state are characterized by very low soil moisture contents, where evaporation exceeds precipitation. There is hardly any scope for regenerations of forest area in DDP unless through a strong participatory micro-level forestry, wherever possible.

The Decadal changes in forest cover looks positive at least on paper, over all forest cover in the state has shown visible increase. Forest cover in the state was only 6.07% in 1991, which has increased to 7.70% in 2001. Similarly other regions namely DPAP, DDP and Others have also shown marginal to substantial increase in the forest cover. This is the flip side of the reality. The substantial increase in forest cover in DPAP from 2.67% to 14.66% 2001 is the result of some districts coming to DDP from DPAP. They had already very less forest cover. On the other hand those district which are hilly and forested such as Dang, Valsad, Dahod, Panchmahal etc. of southern and eastern hilly area have been now covered under DPAP. Besides, the forest survey of India data realise on satellite (Remote sensing) data, which depicts even 'Ganda Babal' (Acacia Abyssinia) as the forest cover. Ground reality shows complete absence of forest cover in (drought) desert areas in the state.

Conclusions

Natural resources such as land, water and forest in the desert and drought prone areas have shown abysmal picture. The status of these resources across these areas is showing alarming signals of deterioration. Quality of land and water has been fast deteriorating particularly in drought prone districts due to perpetual and frequent drought conditions. Impacts of drought have been felt at household level in terms of diminishing and deteriorating supply of drinking water. Households in DDP and DPAP villages have reported significant reduction in adequacy of drinking water during drought periods. The seasonal impact of drought on availability of drinking water has been quite evident at household level in these villages. Issues of adequacy and poor quality of drinking water are serious challenges faced by the people in drought prone areas. One of the serious ecological constraints of drought and drought prone areas has been its scanty forest cover. Those institutional mechanisms are thoroughly neglected in the state that can increase forest cover areas in the state. There have been many cases of serious degradation of forest in the state. Social forestry mechanism has not been taken seriously in the state so far to augment the process of plantation. Thus it is quite evident that drought and desert areas of the state show poor land utilisations, dwindling and fast deteriorating water resources and a sparse forest cover, which is far from adequate.

Annexure III

Table 3.1 Agro-climatic regions in Gujarat

Sub	Region	ACRP Region	Districts	Rainfall (mm)	Climate	Soil
1	Southern hills	13(1)	Dangs, Valsad	1793	Semi-arid Dry Sub humid	Deep black Coastal alluvium
2	Southern Gijarat	13(2)	Surat, Bharuch	974	- do -	- do -
3	Middle Gujarat	13(3)	Baroda, Kheda, Panchamahals	904	Semi arid	Medium Black
4	North Gujarat	13(4)	Ahmedabad, Gandhinagar, Mehsana, Sabarkantha, Banaskantha,	735	Semiarid to arid	Grey Brown Costal alluvium
5	North West arid	13(5)	Kutch	340	Arid	Grey Brown Deltaic alluvium
6	North Saurashtra	13(6)	Amreli, Bhavnagar, Rajkot, Surendranagar	537	Semiarid	Medium Black Calcareous
7	South Saurashtra	13(7)	Junagadh	844	Dry Sub- humid	Medium Black Costal alluvium

Source: "anvesak" Senior Consultant, ARPU Planning Commission, Sardar Patel Institute of Economic and Social Research, Thaltej, Ahmedabad. January-Jun 1995 Volume 25, No.1 (S.N Joshi)

Table 3.2 Distribution of Total Cropped Area in Gujarat across the Drought Regions-2002

Sr. No.	District Under	Area Under			Percentage Area Under				
		Net Area sown	Area sown more than once	Total Cropped area	Net Area sown	Area sown more than once	Total Cropped area	% Total Fallow lands	Cropping Intensity
1	DDP	38156	4681	42837	40.81	5.01	45.81	3.31	112.2
2	DPAP	44042	3528	47570	59.99	4.81	64.80	4.68	108.0
3	OTHERS	14019	2910	16929	66.11	13.72	79.84	4.30	120.7
Gujarat		96217	11119	107336	51.15	5.91	57.06	3.95	111.5

Source: Directorate of Agriculture, Government of Gujarat, Gandhinagar

Table 3.3 Land under Wasteful Uses in Gujarat -1980-81 TO 2001-02

Percentage Area under Wasteful Uses in Gujarat- 1981 to 2002								
1980-81								
Sr. No.	District's Area under	Total Reported area ('00 Ha)	Barren & Unculturable land	Culturable waste land	Permanent pastures & other grazing land	Current fallow	Other fallow	Total
1	DDP	57911	30.15	28.24	2.46	1.86	1.31	64.02
2	DPAP	111308	20.68	15.98	4.06	2.39	2.24	45.35
3	Others	64613	2.81	2.68	5.01	3.20	1.12	14.82
4	Gujarat State	188220	13.30	10.55	4.51	2.87	1.76	32.99
1990-91								
1	DDP	57979	30.07	29.13	2.41	4.43	0.41	66.45
2	DPAP	111269	20.98	16.27	4.09	6.38	0.44	48.17
3	OTHERS	64623	3.70	2.09	4.96	3.96	0.05	14.75
4	Gujarat State	188219	13.86	10.47	4.49	5.51	0.28	34.61
2001-02								
1	DDP	93504	22.88	18.99	4.01	3.25	0.05	49.18
2	DPAP	73410	4.81	2.30	5.23	4.61	0.07	17.02
3	OTHERS	21204	4.85	2.04	4.31	4.24	0.06	15.49
4	Gujarat State	188118	13.80	10.57	4.52	3.89	0.06	32.83

Source: Field survey April/May 2006

Table 3.4 No. of Taluka under each category of Ground Water Development

Year	Type of Talukas	Levels of Ground Water Development				
		W	G	D	OE	S
1991	DDP	7	6	2	5	0
	DPAP	55	15	1	7	2
	Other	61	9	8	14	0
	Gujarat	123	30	11	26	2
1997	DDP	3	4	2	8	3
	DPAP	49	20	2	8	2
	Other	45	22	4	19	2
	Gujarat	97	46	8	35	7
2004	DDP	14	22	4	12	11
	DPAP	51	47	7	7	3
	Other	20	11	2	12	0
	Gujarat	85	80	13	31	14

Category Code :W-White; G-Grey; D - Dark; OE - Overexploited; S - Saline
Source: Narmada and water Resources Department, GOG -1992, 1998 & 2005

Table 3.5 Drinking water availability at HH in Drought and Drought prone villages (Primary Survey Data)

District Name	Name of Taluka	Name of Village	DPAP / DDP Village	Monsoon Normal year		Monsoon Drought year		Winter Normal year		Winter Drought year		Summer Normal year		Summer Drought year	
				Sufficient	Insufficient	Sufficient	Insufficient	Sufficient	Insufficient	Sufficient	Insufficient	Sufficient	Insufficient	Sufficient	Insufficient
				t	ient	t	cient	t	cient	t	cient	t	cient	t	cient
Surendra nagar	Lakhtar	Gangad	DDP	31		31		31		31		30	1	27	4
		Kalam	DDP	31		29	2	30	1	26	5	14	17	9	22
Kachchh	Abadasa	Moti	DDP	30		27	3	30		24	6	23	7	20	10
		Sindhodi													
Banaska ntha	Vav	Shuthari	DDP	70	3	52	21	68	5	50	23	61	12	43	30
		Joravargadh	DDP	52	1	32	21	52	1	32	21	29	24	9	44
		Limbala	DDP	46	3	25	24	45	4	22	27	20	29	3	46
Total DDP				260	7	196	71	256	11	185	82	177	90	111	156
Junagadh	Veraval	Malondha	DPAP	39	2	29	12	39	2	29	12	35	6	14	27
		Badalpur	DPAP	39	1	36	4	39	1	36	4	30	10	23	17
Halol	Panchmahal	Kansaravav	DPAP	21	2	19	4	21	2	19	4	14	9	12	11
		Kherap	DPAP	31		24	7	31		23	8	25	6	17	14
Bharuch	Jambusar	Ankhi	DPAP	96	1	85	12	96	1	85	12	94	3	70	27
		Dehari	DPAP	30	1	27	4	30	1	27	4	30	1	27	4
Total DPAP				256	7	220	43	256	7	219	44	228	35	163	100
Total				516	14	416	114	512	18	404	126	405	125	274	256

Source: Field survey April/May 2006

Table 3. 6 District wise number of villages having degraded quality of water in terms of Fluoride, TDS and Nitrate

Districts under	No. of Villages having values more than maximum permissible limits			
	Fluoride and TDS	TDS and Nitrate	Fluoride and Nitrate	All the three
DDP	170	24	17	9
DPAP	276	95	90	29
Others	163	49	57	16
Gujarat	609	168	164	54

Source: GWSSB Report, 2002

Table 3.7 Percentage Area under Forest in Gujarat

Years	DPAP Districts	DDP Districts	OTHER Districts	TOTAL Gujarat
1991	2.67	3.52	10.12	6.07
2001	14.66	3.76	12.04	7.70

Source: Forest Survey of India, 1991 and 2001

Chapter Four

Impact of Droughts on Agriculture and farmers response to drought

Chapter Four

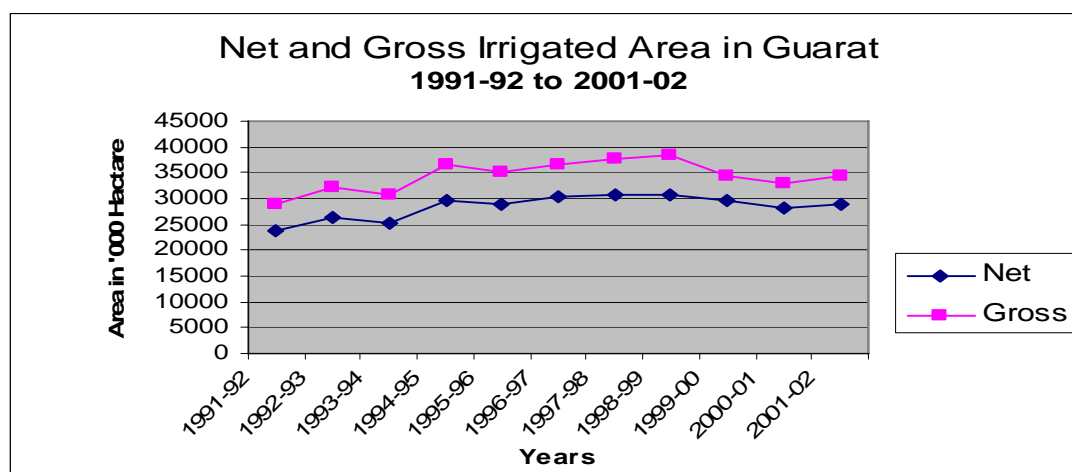
IMPACT OF DROUGHTS ON AGRICULTURE AND FARMERS RESPONSE TO DROUGHT

Introduction

Agriculture development in Gujarat depends largely on only one monsoon rainfall i.e. South West Monsoon during 3 months season between June/July to Sept/Oct in a year. Rainfall is characterised by very scanty in Kutch and moderate to high in Southern part of the state in the district of Dang and Valsad. Rainfall pattern in state follows a north-westerly direction and are very erratic often leading to scarcity conditions especially in Kutch and parts of Saurashtra (Joshi, 1995; Desai and Namboodiri, 1997; Mathur and Kashyap, 2000). The pattern of rainfall largely influences cropping pattern suitable to its agro-climatic conditions along with other factors such as soil type, topography and farmers behaviour in the state. There has been less crop diversification in agriculture in due to un-assured irrigation in the state.

Irrigated area in the state has been showing declining trends in recent times (See Table 4.1) however, irrigation intensity have shown marginal increase only. This increase is likely to influence the cropping intensity resulting in commercial orientation of cropping pattern across the districts in Gujarat.

The overall characteristics of agriculture have been by and large less commercialised in the state. Cropping pattern has been diversified in recent decades that suit the agro-climatic conditions of the state along with livestock farming (Sheikh and Patel, 1996). Operational holding is dominated by the small farm size (average farm size of the state is 2.93, 1990-91) with 52 per cent of holding having less than 2 hectares of the land (Desai and Namboodiri, 1997).



Source: Directorate of Agriculture, Government of Gujarat, Gandhinagar

These features of agricultural development in Gujarat have resulted in its reducing share of state income. Contribution of agriculture to state domestic product has also shown a declining trend during the last three decades, however, in terms of employment, agriculture sector along with fisheries and other primary activity is still the largest in the state. Thus, it can be said that Gujarat is predominantly an agriculture state, the development of agriculture has been neglected due the lack of institutional mechanism. As Gujarat has been demarcated in 7 agro-climatic zones, the agriculture features varies across these zone, though more prominently in the drought (DDP) and Drought Prone (DPAP) areas. Some of the aggregate indicators of the status of agriculture in Gujarat across drought and drought prone areas have been discussed below.

Irrigation Intensity and Cropping Intensity

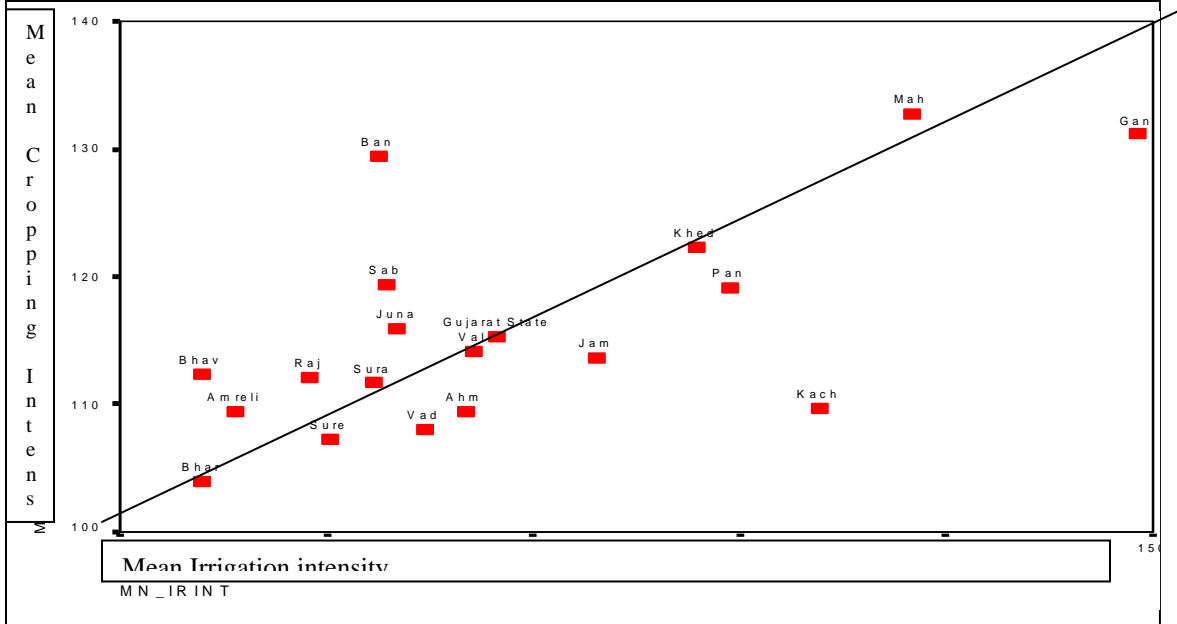
Irrigation intensity is the function of gross irrigated area and net irrigated area in the state. This varies in the state across the regions especially in drought regions. As compared to other state, irrigation intensity of Gujarat is very low. Table 4.2 shows irrigation intensity across drought regions in Gujarat in the 2001-02. The irrigation intensity for the state as whole was 120 per cent in the year 2001-02 which is far below the national average of 135 percent. As irrigation potential of the state is also affected by the regular drought in the state, desert (DDP) and drought prone (DPAP) areas are lagging far behind in increasing the potential of irrigation in the state. DDP and DPAP areas have shown very low irrigation intensity of 115 and 117 respectively in the year 2001-02, whereas the rest of the area have relatively better irrigation intensity (124). Similar variation across the state has also been found in case of cropping intensity.

Table 4.3 shows cropping intensity along with gross cropped areas in various drought and drought prone areas in the state. Like the irrigation intensity, cropping intensity is also a product of gross cropped area and net area shown. It has already been observed in the previous chapter that Gujarat has shown declining trends in net shown area which will have impact on it's over all cropping pattern. It is observed that the copping intensity is also very low across all the regions particularly in drought and drought prone regions of the state. Gujarat has a cropping intensity of 111 per cent. It further varies in drought and drought prone regions. The cropping intensity of 112 and 108 has been found in case of DDP and DPAP areas respectively, while rest of the areas have shown cropping intensity of 120. Relatively higher cropping intensity districts are Mehsana Gandhinagar, Kheda Anand, and Surat. They are also considered to be the better agriculture areas of the state.

However, a close relationship has been noticed in irrigation intensity and cropping intensity across the districts in the state (see Fig.3) Therefore, there is a potential of increasing the cropping intensity with subsequent increase in the irrigation intensity by creating potential irrigation schemes in the state.

Narmada Command Area for irrigation and various ongoing watershed schemes would provide viable potentials in improving cropping intensity with crop diversification in the state. High value crops/crop groups such as oilseeds, cotton, fruits and vegetable may be given priority in the state for cultivation. These groups of crops have shown positive growth both in area and production in recent years (Margdarsika, 2004). These groups of crop either use less water or are grown during the Kharif season thereby reducing the extra demand of water in Rabi season.

Fig. 4.1 Cropping Intensity and Irrigation Intensity in Gujarat-1970-71 to 2001-02



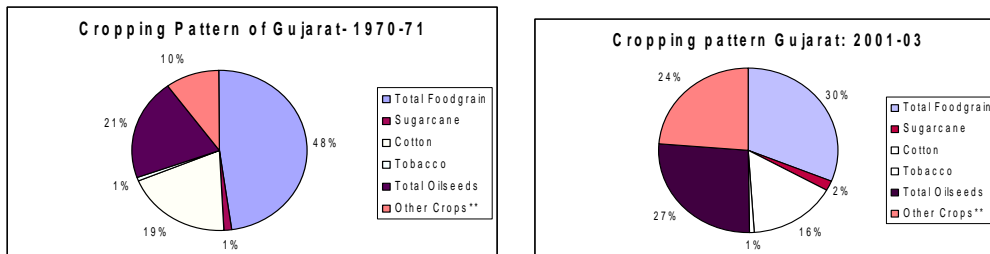
Source: Directorate of Agriculture, Government of Gujarat, Gandhinagar

Thus, both irrigation intensity and cropping intensity are not sustainable in the state hence it results in high fluctuations in production, area and yield of all the major crops in the state. Both these factors also influence the cropping pattern in the state along with several other factors like type of soil, availability of inputs, market facility, prices as well as farmer's choices and preferences (Joshi, 1996). The response to these factors may vary from region to region in any given place and time.

Cropping Pattern in Gujarat: Status and Trends

Cropping pattern of any region is the function of agro-climatic condition along with inputs that are used in agriculture practices. It is the combined function of topography, soil and climatic conditions prevailing in a region. Cropping pattern in Gujarat is dominated by the food grains, oilseeds including groundnuts and cotton crops. Food grain has largest share of 31% followed by oilseed with 27%, Cotton 16% and other crops with 24% of GCA (Gross Cropped Area) of the state. Amongst oilseeds groundnut cultivation alone occupies 18% of GCA of the state during the early years of this century. It is observed that diversification in cropping pattern has taken place in the state as area under other crops which includes fruits & vegetable, spices and tobacco etc have increased during the same period and have occupied almost a quarter of total GCA in tritium year ending 2003.

Figure 4.2 Cropping pattern in Gujarat



Source: Directorate of Agriculture, Gujarat State, Gandhinagar

Long Term Change in Cropping Pattern of Gujarat: 1970-71 to 2002-03

During the last three decades, areas under food grain crops have shown 18 per cent point decline. It occupied almost half of the GCA in the triennium year ending 1972-73. This is due to a substantial decline observed in the areas of coarse food grains of juwar and bajri during the same period. While both oilseeds and other crops have registered increase in their area during 1970-71 and 2002-03. Area under oilseeds has increased from 21% to 27% of total cropped area of the state during the same period, while other crops have increased their area from 10% in 1972-73 to 24% in 2002-03. Other crops include mainly spices, fruits and vegetables and other miscellaneous crops. Cotton being a major crop in the state has shown decline in its area during the same period. Total area under cotton cultivation has declined from 19% to 16% of GCA of the state in the last three decades. Area under sugarcane shown cent percent increase during the same period. There has not been any change in the area of tobacco in the state in three decades.

Thus, change in the cropping pattern shows a positive sign towards crop diversification favouring more non-traditional crops in the state. This positive change can be attributed to yield factors as well the high value of other non-food crops in the market. The agro-climatic conditions in the state are also favourable for other crops such as horticulture, vegetables and spices. With more scientific back up in their farming, these crops can yield more sustainable benefits to the farmer of the state. The increase in the area under non-food crops indicates a positive response of farmers of the state to increase the value of the agricultural out put. With frequent droughts and inadequate irrigation, crop diversification along with non-farm activities related to agro-based activities are possible way out for the farmers of Gujarat in order to sustain their livelihood and agriculture in the long run. The various agro-climatic regions of the state produce different crops and the cropping pattern varies across these regions, therefore the productivity of major crops namely, food grains, oil seeds and cotton also varies across these regions in the state.

Agriculture Productivity in desert and drought areas in Gujarat: Status and Trends

The crop wise productivity has been worked out for this exercise to make a comparison between the regions. Table 4.4 shows productivity of food grains across the drought and drought prone areas in the state. The yield of food grains has traditionally been lower in desert and drought prone areas as compared to other areas in Gujarat. During 2001-03 the average yield of total food grains in DDP districts was 898 kg/ha while in DPAP districts it was 1074. However, the average yield for other districts has been far better than that of the DDP and DPAP districts. Lower productivity in desert and drought prone areas is the result of lack of assured irrigation and other agronomical inputs.

These areas generally suffer from low technological inputs of agriculture, coupled with regular and perpetual drought conditions which results in lower productivity. This may lead to problems of food security in the desert and drought prone areas in the state. However, an increasing trend in productivity of total food grains has been observed during the last two decades across Gujarat. The total food grain yield was 580 kg/ha during 2001-03 in DDP which increased to 671 kg/ha in 1981-83. DPAP areas (districts) altogether have also shown increase in their yield of total food grains crops during the same period except a

marginal decline in the year 1991-03. The rest of the area has shown continuous increasing trends in the yield of total food grains.

In case of productivity of total oil seeds in the state, again the drought and desert areas are lagging behind from the rest of the areas in recent time. It is noted that Gujarat is one of the leading producer to of ground nut in the country and it accounts for more that 80 per cent of total oil seeds produced in the state. Table 4.5 shows yield of total oil seeds in desert and drought areas in Gujarat during the last two decades. During 2001-03 the average yield of oil seeds were 921 kg/ha, 854 kg/ha and 1190 kg/ha in DDP, DPAP and Other districts respectively. However, till 1991-93 there were only districts in DDP namely Kutch and Banaskantha which reported better yield in oil seeds production particularly castor. Thus, they have registered comparatively higher yields of total oil seed during 1981-83 and 1991-93. The decline observed in recent year i.e. during 2001-03 is due to inclusion of other districts DDP areas which had registered a lower productivity of total oilseeds in the state during the same period. Increasing trends in the productivity of total oilseeds has been observed in DPAP districts during the last two decades except a slight decline registered during 1991-93. Increasing trends continues in the productivity of oil seeds in case of non-DDP and DPAP areas in the state.

Gujarat is also known for cotton growing regions in India. However, cultivation of cotton in the state has suffered on account of closure of cotton textile mills in the state. The productivity of cotton in the state had suffered due to reduction in the area under for the lack of market. Table 4.6 shows yield of cotton in Gujarat. The average yield of cotton in DDP, DPAP and Other districts were reported to be 179 kg/ha, 208 kg/ha and 270 kg/ha respectively during 2001-03. Significant reduction in the productivity of cotton has been observed in all the areas in the state during the last two decades. This poses a serious problems of crop diversification in the state as cotton is one of the high value cash crop which gives farmers a relatively good returns.

Thus it has been observed from the above discussion that drought and drought prone areas of Gujarat has been showing poor productivity of major crops grown in the state. The trend in the productivity is only favourable in case of total food grains due to increase in the productivity of wheat. The other major crops in Gujarat namely total oil seeds and cotton has shown significant decline in their productivity across drought and drought prone regions in the state.

One of the serious concerns in the drought region of Gujarat is its poor status of livestock. In terms of livestock population the state does not faire well in the country. However, a large number of local communities especially in drought and drought regions are dependent of livestock for their livelihood. The livestock population varies across these regions in the state. During 2003 livestock census DDP districts accounted for 23.54 % of the total livestock of the states, where as DPAP districts shared 24 % of the total livestock of the state (See Table 4.7). However, they together constitute more than 50 % of the total area of Gujarat. The rest of the districts have 52% of total livestock of the state. The most striking feature of livestock scenario in the state is that the share of DDP districts has declined during the last two decades. The share of livestock in DDP district in 1982 was 34%, which further declined to 24% in 2003. Whereas the other districts in DPAP and Other regions have shown substantial increase in the total population of livestock. This indicates the low potential of desert and drought prone areas of the states for the development of livestock

due to frequent droughts. The overall development of agriculture and livestock in Gujarat especially in drought and desert areas has not been encouraging and these areas lag far behind compared to rest of the areas in the state. The household characteristics at villages has also reflects somewhat vulnerable agriculture conditions in these areas.

Vulnerable characteristics of agricultural households in drought and drought prone areas in Gujarat:

Ownership of land

Land holding size class has been divided into 4 categories of marginal, small, medium and large holdings. The overall distribution of formers as per their land holdings has been quite uniform for all the 530 households surveyed. However, a significant variation has been observed at village level across DDP and DPAP areas in the state. Table 4.8 shows distribution of households as per their size of the land holdings. Out of 530 households surveyed in the study area 260 HH reported without having any landholding. Thus, about 49 per cent of total HH in the study areas are landless. The proportion of landless households is reported relatively higher in DDP villages. Distribution of HH by landholding varies in DDP and DPAP villages. Usual pattern of relationship of landholding distribution has been observed in case of DPAP villages (Combined together), whereas DDP villages together have shown different pattern. The number of HH decreases with increasing size of the land holdings in all the villages put together in DPAP areas, in contrast the number of HH increasing with increasing land holding size up to small and medium land holding size in all the DDP villages. Thus, DDP villages are more vulnerable to the risk of drought as far as their ownership of land is concerned. Relatively higher proportion of landless HH makes these villages susceptible to problems related to drought. Ownership of land shows quite opposite scenario in DDP Villages as compared to DPAP villages. Generally desert areas have large holdings across HH as productivity of land is very low. The low productivity of land in DDP villages is the result of the lack of various sources of irrigation as well.

Sources of irrigation and cropping pattern

Field survey reveals that agriculture households in drought and drought prone area severely lack assured irrigation for agriculture. Table 4.9 shows percentage of HH with sources of irrigation by land holdings. Out of 530 HH 253 HH here engaged in agriculture activities. Amongst these 253 HH only about 16% HH reported using well irrigation for agriculture followed by 13% HH with tube well. Canal and ponds are not significant sources of irrigation as only 2.37% of the total HH reported using them for irrigation. However, a marginal variation has been observed across the landholding size class of farmers. Thus, the drought and drought prone areas of Gujarat largely depend on well and tube well for irrigation purposes. However, they are also not significant sources of irrigation. Complete lack of irrigation facilities and sources has been observed in these villages. Ownership of land and available irrigation facilities plays a major role in determining cropping pattern, along with other vital geographical factors.

Preference of Crop cultivation at HH level

As mentioned earlier that cropping pattern is dominated by food grains on a subsistence level in drought regions, the field survey of these region reveal that food grains especially cereals and pulses are most preferred grown crop by the agriculture HH. Table 4.10a shows percentage of HH growing different crops by their landholding size. More than 46% of total HH that are engaged in agricultural activities grow cereals followed by 25% of HH which grow pulse. Cotton and Groundnut are the two other most grown crops in the drought areas in Gujarat. It has been observed that the percentage of HH growing cereals is higher in case of marginal and small farmers than those of medium and large farmers. These cereals crops are largely coarse cereals (millets) such as Bajri and Juar. However it does not holds true in case of pulses .

Most of medium and large farmers grows cotton to get high returns, whereas, in case of groundnut cultivation, small farmers dominates, followed by large and medium farmers reporting with 12% , 10% and 11% of the total HH respectively. Thus, the pattern of crop preferences shows traditional subsistence farming in drought and drought prone areas in Gujarat. This makes HH in these areas more vulnerable to the risk of failure of crops particularly food crops leading to the problem of food security.

A supplementary Table 4.10b shows the percentage of HH growing different crops preceding to five years from now. It has been observed that agriculture HH has been more dependent on food crops (cereals and pulses) than on the others. HH survey reveals that formers in drought and drought prone area are heavily dependent on food crops rather than non food crops. Though the state level aggregate cropping pattern suggests a marginal crop diversification, field survey date presents quite opposite results in case of DDP and DPAP areas. The dependency on cereal crops has been observed across the land holding size of the farmers in the study area. In half a decade times, the change in cropping pattern has not been observed, however, the current pattern suggests a highly subsistence level farming practiced in DDP and DPAP villages in the state. Farmers with subsistence level farming may suffer a lot during the scarcity period especially during drought years. One of the striking features of farmer's choice of crops is that not a single HH has reported cultivation of fodder crops. The decline in the share of livestock in DDP areas, during 1982-2003, can be attributed to the fact that these areas experiences regular drought like conditions, and therefore the farmers cannot afford to have fodder cultivation instead. There has been a serious problem of food security in drought prone areas especially in (Dahod and Panchmahal) eastern hilly regions in Gujarat (Chakravarty & Dang, 2006). The subsistence forming practices has lead to low levels of mechanization and farm input used by the farmers in dry (drought regions) is the state.

Level of farm mechanisations and productive assets of Farmers

Table 4.11 shows various agronomical inputs used by the farmers HH in the study areas. Out of 257 HH that belongs to farmers, 177 (69%) of HH used only simple "Desi" seeds, whereas only 80 (31%) reported using HYV seeds. However, 44% of the farmers reported using chemical fertilizers to maintain the yield level. Only about 20% of the farmers used other fertilizers such as organic and compost for better yield. Use of pesticides is not significant across all the land holdings of farmers. Less variation has been observed in the use of these inputs across the landholding of the farmers. However, marginal farmers

reported very less use HYV seeds and chemical and others fertilizers. Thus, the marginal farmer groups in all the 12 villages surveyed in DDP and DPAP areas, reported subsistence nature of farm practices.

Table 4.12 shows distribution of productive assets by landholding size in the study area. Distribution of productive assets in terms of mechanized used of agriculture implements and use of tradition plow (ox driven showing implements), shows low levels of use on farm particularly in drought regions in the state. It has also been observed that there has been no significant change in the used of productive assets either mechanized or otherwise during the last five years. Out of 270 HH, 115 HH reported using “plow” currently. Instead, the number of HH has shown increase in last 10 years particularly in last 5 years using plow as a productive agriculture assets. Mechanization of productive HH assets (implements) has been very poor in drought regions in Gujarat. However there is an increasing trend in the use of tractor but it is not significant as only 13 HH reported having tractors while only 3 HH reported having thresher as their productive assets, currently. More than 100% increase in tractors has been observed in the study area. It is observed that mechanized farm assets are concentrated with large farmers. What ever mechanized productive assets, which are reported, they belong largely to large and medium farmers. Thus, the field observation reveals a clear picture of poorly developed agriculture in drought areas of Gujarat. It has been observed that agriculture in drought (DDP) and Drought prone (DPAP) areas is highly characterized by subsistence nature of farm practices with comparatively lower productivity. However, variation in the use of modern farm inputs such as HYV, chemical fertilizers and use of tractors and thresher has also been observed in these areas. Marginal and small farmers have shown very low levels of use of modern farm inputs and mechanized productive assets. Thus, the agriculture output also varies across the landholding size of the farmers. This scenario reveals vulnerability of agriculture during the extreme natural events particularly during drought. The coping strategies and response of farmers to drought would vary across the farmers groups.

Impact of Drought on agriculture productivity and Income

The situation of farmers is drought regions of the state get worst during drought period. The most visible impact of drought could be seen in either reduction of harvest or total failure of crops. Table 4.13 a shows the percentage loss of harvest (total production) across the villages in DDP and DPAP districts which have been surveyed during April / May 2006. Majority of HH reported about 25 to 50 per cent loss of their harvest in the last drought. Out of 234 HH which reported loss of agriculture produce during the last drought, 141 of then report about 25 to 50% loss, 39 HH reported 50 to 75% loss and 46 HH reported more than 75% loss of their agriculture product in all the 12 villages from 6 districts in DDP and DPAP areas in state. Villages of Panhmahal (DPAP) districts are the worst affected villages in terms of the loss of harvest of their agriculture output followed by Junagadh (DPAP) and Banaskantha (DDP) districts. It is noted that Panchmahal and Banaskantha are tribal districts of Gujarat, which faces acute problem of food security during drought period.

Table 4.13b shows percentage of HH reported total failure of crops during the last drought. Only about 15% of the total HH surveyed reported complete loss of production during last drought. 28% of HH reported failures but partial failures. Others did not give any response to these questions. Again Junagadh and Panchmahal districts are the worst hit districts in

the last drought. The impact of drought on the crop failure may vary across various land holding size of the farmers.

Size of the land holdings and crop failure

It is also important to look into the loss of production / crop failure across the land holding size of the HH in the drought and drought prone areas of the state. Table 4.14 shows loss of harvest in percentage terms across the land holding size of the farmers in the study area. Amongst all the (reported) HH which has experienced loss of harvest during last drought almost all large farmers in the study area reported loss of harvest, majority of them reported loss of harvest up to 50%. Loss of harvest was reported by the less number of marginal and small farmers than the others. Thus, it is observed that drought affects loss of harvest differently across land holding size of the farmers. Over reporting of loss of production is common by larger farmers as they expect state authority to compensate their loss of production through various drought relief schemes. Generally, the benefits given to farmer during drought are less known to marginal and small farmers. The loss of production in drought has been prominent across the different landholdings size of the farmers. It has also been observed the impact of drought varies across the different crops (type of crops).

Impacts of drought on Crops

Table 4.15 shows districts wise production of different crops in current years, five years and ten years ago. This data may not be totally reliable as 5 & 10 years recall period is too long to give correct estimation. However, a visible pattern has emerged out of the crops wise average production in all the 12 villages from DDP and DPAP areas. Following inferences can be drawn from Table 4.15:

- (i) Signification reduction in average production of all the crops has been observed in Drought regions of Gujarat
- (ii) The reduction in productivity of crops has been more in DDP villages than DPAP villages, for the entire 12 village surveyed.
- (iii) Reduction in crop productivity especially food crops i.e. wheat, Bajari & Juwar has been significant compared to Paddy. Paddy generally needs irrigation for a long period, thus, wherever, there is additional irrigation facilities, paddy is cultivated. Therefore, the impact of drought has been less visible.
- (iv) Signification reduction in productivity of fodder crops has also been observed during drought years in both the regions.
- (v) Cash crops especially cotton and oilseeds (groundnut and cotton) have also suffered on account of drought, striking decline in their productive has been observed during drought period.
- (vi) One of the sticking observations is that, there has been general decline in crops productivity during last one decades, it gets worst during drought years. This can be attributed to the fact that regular drought conditions have affected overall productivity of crops both in DDP and DPAP areas in the state.

Thus, it has been observed that, drought and drought prone areas of Gujarat largely depend on subsistence agriculture (very less crop diversification) with low levels of mechanization. Crop diversification has not been observed particularly in the villages that have been

surveyed in DDP and DPAP districts. Significant impact of drought has been reported by the farmers. Impact of last drought on crop productivity has been striking. A sharp decline in the crop productivity has been reported across all the crops in DDP and DPAP villages that are surveyed. However, farmers in these villages have responded in various ways to cope up with the impact of drought.

Impact of Drought on Agriculture income

Most of the data particularly from primary survey on agricultural income are not reliable, as they are grossly under reported. However, a significant impact of drought has been observed on the overall reduction of income at the household level in this study. Table 4.21 shows agriculture income of HH by their land holding size in DDP & DPAP villages in Gujarat. Out of 530 HH 255 (48%) reported irregularity of agriculture income due to drought. All these households belong to agriculture groups of main occupation categories in this case. An estimate has also been attempted to arrive at average income of HH as per their land holding size both in normal and drought year. It has been observed that in a normal year the relationship of income with landholding size is positive as it shows increasing trends with landholding size. Average annual income of all the HH surveyed comes out to Rs. 21739 in a normal year, while the same reduces to Rs.8725 in a drought year. In another words, agriculture income of the household reduces to almost 1/3rd due to drought in DDP and DPAP villages.

However, in case of all the landholding size groups put together, agriculture income reduces to more than half in all the category of farmer. Landless particularly those which are engaged in agriculture activities as agriculture labourers suffer a lot. Those having no land for cultivation reported highest reduction in their income. Almost ¼ reduction of income has been observed in no-land category HH. Thus, it has been observed that landless HH are badly affected in drought period. Marginal farmers reported very less agriculture income, which makes them more vulnerable to natural calamities particularly during drought. Impacts of drought have been felt in many spheres of agriculture households which makes them vulnerable to fight against it. In additions, these impacts in long run results in overall backwardness of these regions. It is thus, important to understand that how far the farmers are aware of multi-dimensional impacts of drought and what kind of measure they take in response to it.

Farmers Response and coping strategies to Drought

Agriculture Preparedness for drought

Farmers in all 12 villages, which have been surveyed, have reported their various kinds of adaptability to cope up with droughts and hence in turn reduce or minimize the impact of drought. Table 4.16a shows the preparedness of farmers against drought in DDP and DPAP district. Out of 530 HH 156 (29.43%) HH reported with some preparation to cope with drought, while 18% of them reported no preparation. This indicates the helplessness on the part of farmers to cope up with drought conditions. Majority of them about 52% has given no response as their primary occupation is not agriculture.

Significant variation has been observed across these districts in terms of farmers preparedness against drought. Highest number of farmers (43%) reported preparation against drought in Panchmahal district, followed by 38% in Junagadh, 30% in Banaskantha

district. In other words, DPAP districts showed better preparedness of drought compared to DDP districts except for Banaskantha districts. Least number of farmers from Kutch (18%), followed by Surendranagar (26%), has been reported preparation against drought. Again the desert (DDP) areas suffer a lot and have shown a kind of helplessness on part of farmers to cope up with drought conditions. However, whatever little strategies, they can adopt, those are not sufficient to reduce / minimize the impact of drought.

Amongst the various coping strategies that have been adopted by the farmers, “late sowing” is important as about 40% of the farmers reported late saving of crop to avoid the seasonal impact of drought. This strategies is followed by mixed cropping (35% formers), less use of fertilizers (17% farmers) and the use of drought resistant crops (only 3%) (See Table 4.16b). Similar variations have also been observed across the districts in DDP and DPAP area in various adapting strategies to cope up with droughts. “Mixed cropping” and “Late sowing” has been the common practices in all the districts.

However, tribal districts namely, Panchmahal (DPAP), Banaskantha (DDP), and Bharuch (DPAP), have shown higher reposes in adopting mixed cropping to reduce the impact of drought, as compared to other districts. Similar reposes have been reported in case of adopting to late sowing of crops, in this case response of farmer from Junagadh districts (57%) has been highest, followed by Surendranagar (42%). More than 1/3rd of the farmers reported adapting to “late sowing” in rest of the other districts.

Relatively higher number of farmers in Surendranagar (6.45%) and Banaskantha (5.80%) both in DDP areas have reported adapting to drought resistance seeds (See Table 4.16b). There also exists a marginal variation in using less fertilizer as copping mechanisms across these districts. Again tribal districts namely Panchmahal and Bharuch reported higher number of farmers using less fertilizer. In shorts DPAP districts particularly Panchmahal and Bharuch have showed poorer responses in adopting strategies for to fight against drought. DDP districts faired relatively better, as there is no other alternative for them to follow in case of drought.

Weak adaptation has been observed in case of using drought resistance seeds / crops across the villages in these districts. Not a single farmer reported using drought resistance variety seed to fight drought in Panchmahal and Baruch districts. It should be noted that these two districts are tribal dominated districts, where there is a general lack of awareness of modern use of agronomical inputs. On the other hand, the access to drought resistance seeds in this area is also poor. Government agencies along with market forces have been unable to reach these inputs to the farmers in such remote areas. There is also a lack of linkages between farmer’s adaptability and scientific research community. Agriculture research need to bridge these gaps and it should also make available, the required inputs that are drought resistance to the farmer.

Amongst the main occupation groups, HH engaged in Agriculture top the list in doing some preparation against drought (See Table 4.16c). Out of 103 agriculture households, 62 reported mixed cropping, followed by 29 households that adapted late sowing as one of the copping strategies to fight against drought. Even in adopting to drought resistance crops (seeds) or less use of fertilize, there were few HH which reported the same. Thus, it clearly indicates weak linkages of research community and farmers. Agriculture extension services and awareness to farmers have not been taken seriously so far in the state particularly in

DDP and DPAP districts. However, farmers have shown resilience to drought over a period of time.

Farmers Resilience to Drought

Table 4.17 shows response of farmers to drought in showing crops again after it failed in last drought. Out of 530 HH, 32 HH (6.04%), have reported sowing crops again after the last drought in the same season. 199 HH reported with negative responses. NR (Not reported) HH includes those of other occupation groups. This shows a somewhat resilience of farmers towards drought. Visible variation at district level has been observed in farmers' resilience by adapting to re-growing of same crops after its failure in drought. More than 20% HH in Panchmahal followed by 12% HH in Junagadh have reported re-growing of crops after drought. Not a single HH reported re-growing of crops in Kutch (DDP). Only 6% of the HH in Surendranagar, 3% in Banaskantha reported re-growing of crops. Thus, it is very much clear that DDP districts have shows very less resilience of farmers to drought in DPAP districts.

Amongst the crops that were re-grown after the drought, cereals and cotton were the major ones (in terms of number of farmers reported re-growing of these crop (See Table 4.18). 18% of the total HH reported re-sowing of cereal crops followed by 6% which reported re-sowing of cotton. Farmers resilience shown indicates a subsistence nature of farming towards food security with some anticipatory financial support from cash crops that are usually expected from cotton. District level variation was striking in this case (See Table 4.18). Again Panchmahal and Banskantha responded well with 52% and 14% HH adapting to re-sowing of cereal crops after the drought whereas, 31% HH in Surendranagar reported re-sowing of cotton. It is noted that Surendranager is a major cotton growing districts in Gujarat. Hence, it is evident from the village survey in DDP and DPAP districts, that tribal areas in both these districts rely more on cereal crops than on the cash crops. Responses and resilience of farmers in drought and drought prone areas in Gujarat have been not been encouraging. They suffer on account of crop failures, productivity losses and are unable to cope up with drought due to lack of supports. However, farmer's resilience in terms of payment of land taxes to government has been encouraging.

Table 4.22a shows farmer's resilience in terms of payment of land taxes as per their land holding. Almost all the HH with land have paid land taxes. It has been observed that land taxes has been paid regularly even during drought years. On an average Rs. 90 is to be paid annually from each farmers HH. But the land taxes increases with increasing land holdings. Large farmers on an average have paid Rs.170. The short fall in land revenue and tax paid has been more in case of large farmers. Though the amount of land tax is very low, however, regularity in payment shows farmers resilience. The land taxes are being paid regularly by all the farmers even in drought year.

A supplementary Table 4.22b shows district wise regularity in payment of land taxes in selected districts of DDP and DPAP. Almost 45% of total HH in these districts reported regular payment of land tax, while only 3% of HH reported irregular payment. Payment of land tax, were batter in Panchmahal and Banaskantha districts with 63% and 50% of their HH reported regular payment of land taxes. Kutch reported with only 26% of its total HH making regular payment of land taxes. In short, farmers in drought and drought prone areas of Gujarat have responded well in showing their resilience during drought by making

regular payment of land taxes. Usually in drought conditions or for that matter in any natural calamities, people expect governmental agencies and others to give relief in payment of their loan or taxes. Assistance to farmer provided by the government or any other agencies during drought period reflects the seriousness of the efforts to tackle the grave situation associates with each drought.

Farmer's own response to associated problems during drought

HH response to various problem associated with drought reveals very poor supports / facilities to agriculture in these areas in state (See Table 4.19). About 21% of the total HH surveyed reported severe lack of irrigational facilities, while 5 % HH reported lack of HYV seed. Only about 4 % HH reported lack of fodder crops, while 2 % of them reported having no crops insurance. Thus about 34% of the total rural HH surveyed reported serious lack of various kinds support system to agriculture.

Significant variation has been observed across the district in this regards. Lack of irrigation is one of the major problems in drought prone villages in both DDP and DPAP districts. However, the scenario is bad in Panchmahal and Junagadh districts where almost 30% of HH reported lack of irrigation facilities in each districts, followed by Banaskantha (25% HH), Surendranagar and Bharuch (17% each). Vary low percentage of HH (11%) reported lack of irrigation facilities in Kutch, as it predominantly depends on un-irrigated agriculture. Farmers responded well with their suggestions to tackle these associated problems of drought in desert and drought prone areas in Gujarat.

Table 4.20 shows farmer's responses with their suggestion to tackle the problems associated with drought. Almost similar number of HH (35%) responded with some suggestion, so that they can overcome various problems associated with drought. 14% of total HH in these drought villages suggested to have assured irrigation facilities and fertilizers, 15% suggested to have loan for agriculture inputs, while 5 % of total HH surveyed suggested to have crop insurance. Only 2% asked for agriculture training and awareness generational help. Very few HH only 2 out 530 suggested assured employment during drought. This indicates a higher dependency of agriculture HH towards agricultural activities.

Assistance to Farmers during Drought

General information is provided by the government prior to drought in particular years. Village panchayats make assessment of drought and give report to taluka panchayat office and they in turn report them to district panchayat offices or to district collector. Based on the assessment in a system called Anabari¹ district collectors declares drought and orders beginning of relief works in affected villages. However, the system looks participatory, but information related to drought is not being well disseminated in the drought prone regions of the state.

Table 23a shows the type of information obtained by farmers prior of the scarcity work. It is observed that prior information has not been obtained by the majority of the HH in case of drought in these areas. Generally, farmers are given information about declaration of drought relief work (drought schemes), and information on drought resistance crops. It has

¹ = Annabari – see notes in the annexure.

been observed that very few farmers have reported having information on the above drought related information. Out of 530 HH surveyed only 32 HH reported having information on the above mention drought information. Majority of them 24 HH reported having information about drought relief work. Thus, in other words, farmers are not being informed on the drought. This could be attributed by the fact that the agencies through which information to farmer is provided, are not functioning accordingly or they are over burdened. Generally information is provided by 'Gram Sevak', 'Sarpanch' and 'Talati'. They all are considered to be village level actors (See Table 4.23.b). 'Sarpanch' which is an elected members, appeared to be more informative at village level as 4 % to the total house holds obtained drought related information from them. A relatively very lower number of HH (1.32%) has been given drought related information either by Gram Sevak or by Talati. Thus, very poor network of information has been observed in drought and drought prone district in Gujarat. However, these information particularly declaration or prediction of drought are seldom correct. Only 6% of HH reported having this information correct and hence response of the farmer in using these information is also very poor (See Table 4.23c)

Inadequacy of Guidelines for drought Assistance

It has also been observed that farmer not only receives little information on drought, but they also are without guidelines (See Table 4.24a). Out of total HH surveyed only 17 HH reported having information with guidelines. 15 HH reported that they do not get information with guidelines. Thus only 6% of the HH reported information either with or without guidelines. Often these farmers do not receive any contingency plan for crop cultivation during drought period. Table 2.25a,b,c shows HH that received the contingency plan for crop cultivation during drought period. Out of 530 HH only 6 HH have reported having received to contingency plan for crop cultivation during the drought period. 81 HH reported having no contingency plan from the Government. A very few number of HH reported contingency plan on crop planning and use of fertilizers. The contingency plan is generally provided by the 'Gram Sevak' at village level and agriculture department at the state level.

Farmers Awareness on Various Drought relief schemes

Since few farmers get information on contingency plan, their uses are restricted to them only. There has been serious rack of awareness of governments' information on drought related matters. Table 4.26a,b shows the farmers awareness about government's various programs for drought relief. Out 530 HH only 47 HH (about 9%) reported having any knowledge of government. programs on drought relief, while 59 HH (more than 11%) showed complete ignorance towards relief programs. Nearly 80% of HH gave no response to this question as majority of them are not related to this questions. Both the districts in Saurashtra region namely Surendranagar (DDP) and Junagadh(DPAP) have shown complete ignorance, as non of the HH in these districted were aware of the government programs on relief work, cattle camp, and prices of fodder. HH reported awareness of above mentioned government programs are 27 (5%), 12 (2.26%) and 8 (1.5%) respectively. Poor response of farmers on awareness of government programs indicates the total lack of initiatives from the government part. However, there were few examples of initiatives taken by the CBOs and private trust to organize cattle camp and distribution of fodder.

Marginal variation across the districts has been observed in general awareness of farmer regarding the relief assistance to farmers by the government.

Conclusions

Impacts of drought on agriculture have been quite visible in desert and drought prone areas in Gujarat. The severity and frequency of droughts in larger part of the state has lead to drastic reduction in crop production and productivity in the long run. The extent of crop loss has been huge particularly in desert (DDP) and drought prone (DPAP) areas. These areas have also witnessed declining trends in Net Sown Area (NSA) due to lack of assured irrigation. Irrigation intensity of the state is low as compared to other states in the country. However, desert and drought prone areas have shown further lower irrigation intensity and cropping intensity. A close relationship has been found in irrigation intensity and cropping intensity in the state. There has been no sign of improvement in these two aggregates parameters of agriculture development in the state particularly in drought regions. Almost all the crops have shown declining trends in their productivity over last 3 decades. The decline in the productivity of food grains has been sharper than the other crops, which is a serious concern for food security in drought areas especially in drought prone areas of eastern tribal districts. Animal husbandry in desert areas has not been encouraging, however, there lies a potential for its development in DPAP districts. Severity and regularity of drought have forced large number of population particularly in drought prone area in the state, to cope up with it on their own.

Farmer's response to drought reflects their helplessness and resilience, which has been developed over time. They to prepare for the next drought have adapted traditional agriculture methods. This is due to weak linkages between farmers and agriculture research community in the state. Various government agencies have not been able to provide adequate information related to drought on time to the farmer in remote villages. It has been observed that there is a serious lack of information and contingency plan to fight against the drought. Information to cope up with droughts seldom come with the guidelines, hence their uses are limited to very few farmers in drought regions.

Annexure IV

Table: 4. 1. Total Irrigated Area in Gujarat

(Unit – area in '00 Ha)		3 years average	
Years	1992-95	2000-03	
Total Irrigated Area	36582	35173	

Source: Directorate of Agriculture, Government of Gujarat, Gandhinagar

Table 4.2 Irrigation Intensity in Drought prone Area in Gujarat

Sl. No	Districts under	2001-02
1	DDP	115.18
2	DPAP	117.30
3	OTHERS	123.81
4	GUJARAT	120.07

Source: Directorate of Agriculture, Government of Gujarat, Gandhinagar

Table 4.3 Cropping Intensity in Gujarat , 2001-02

Sr. No.	District Under	Area in '00 Ha			Percentage Area			Cropping Intensity	
		Net Area sown	Area sown more than once	Total Cropped area	Net Area sown	Area sown more than once	Total Cropped area		Total Fallow lands
1	DDP	38156	4681	42837	40.81	5.01	45.81	3.31	112.2
2	DPAP	44042	3528	47570	59.99	4.81	64.80	4.68	108.0
3	OTHERS	14019	2910	16929	66.11	13.72	79.84	4.30	120.7
4	GUJARAT	96217	11119	107336	51.15	5.91	57.06	3.95	111.5

Source: Directorate of Agriculture, Government of Gujarat, Gandhinagar

Table 4.4 Yield of Total Food grains in drought regions of Gujarat 1981-83 to 2001-03

Unit = Kg/ha		Average Yield (3 year Moving average)		
Sl.No	District	1981-83	1991-93	2001-03*
1	DDP	580	671	898
2	DPAP	925	910	1074
3	OTHERS	1219	1344	1426

Source: Margdarshika of Different Years, Department of Agriculture, GOG,

*Note: Refers to Districts under DDP (6 districts) and DPAP (10 districts) after the change in 1995-96 on the recommendation of Hanumantha Rao Committee Report.

Table 4.5 Yield of Oilseed Cultivation in drought regions of Gujarat 1981-83 to 2001-03

Unit = Kg/ha	District	Average Yield (3 year Moving average)		
		1981-83	1991-93	2001-03*
Sl.No				
1	DDP	1060	1254	921
2	DPAP	765	759	854
3	OTHERS	969	995	1190

Source: Margdarshika of Different Years, Department of Agriculture, GOG,

*Note: Refers to Districts under DDP (6 districts) and DPAP (10 districts) after the change in 1995-96 on the recommendation of Hanumantha Rao Committee Report.

Table 4.6 Yield of Cotton Cultivation in drought regions of Gujarat 1981-83 to 2001-03

Unit = Kg/ha	District	Average Yield (3 year Moving average)		
		1981-83	1991-93	2001-03*
Sl.No				
1	DDP	1096	738	179
2	DPAP	1146	876	208
3	OTHERS	2212	1632	270

Source: Margdarshika of Different Years, Directorates of Agriculture, GOG,

*Note: Refers to Districts under DDP (6 districts) and DPAP (10 districts) after the change in 1995-96 on the recommendation of Hanumantha Rao Committee Report.

Table 4.7. Distribution of Total Livestock in Gujarat- 1982-2002

Type of Taluka	1982		2003	
	Total Livestock	% Share	Total Livestock	% Share
DDP	6325752	34.30	5378560	23.54
DPAP	3606509	19.56	5499219	24.07
Others	8508104	46.14	11968203	52.39
Total Gujarat	18440365	100.00	22845982	100.00

Source: Directorate of Animal Husbandry, Government of Gujarat, Gandhinagar

Table 4.8 Village wise land holding category HH

District Name	Name of Taluka	Name of Village	DPAP / DDP	0. to 2.5	2.6 to 5.0	5.1 to 10	10 + above	No Land	Grand Total
Surendranagar	Lakhtar	Gangad	DDP	0	4	5	9	13	31
		Kalam	DDP	0	2	6	5	18	31
Kachchh	Abadasa	Moti Sindhodi	DDP	0	6	3	1	20	30
		Shuthari	DDP	4	8	7	3	51	73
Banaskantha	Vav	Joravargadh	DDP	7	15	9	6	16	53
		Limbala	DDP	4	8	12	8	17	49
Total				15	43	42	32	135	267
DDP									
Junagadh	Veraval	Malondha	DPAP	2	14	7	5	13	41
		Badalpur	DPAP	4	5	9	1	21	40
Halol	Panchmahal	Kansaravav	DPAP	10	5	0	0	8	23
		Kherap	DPAP	19	3	3	0	6	31
Bharuch	Jambusar	Ankhi	DPAP	8	11	10	8	60	97
		Dehari	DPAP	2	0	7	5	17	31
Total				45	38	36	19	125	263
DPAP									
Total				60	81	78	51	260	530

Source: Field survey April/May 2006

Table:4.9 Percentage HH with source of irrigation by land holding

Category of Land	Well	Tube well	Canal	Pond	Other	Total
Marginal farmers	4.92	22.95	3.28	1.64	0.00	100.00
Small Farmers	20.31	12.50	3.13	1.56	0.00	100.00
Medium Farmers	17.39	8.70	1.45	2.90	0.00	100.00
Large Farmers	22.03	6.78	1.69	3.39	3.39	100.00
Total	16.21	12.65	2.37	2.37	0.79	100.00

Source: Field survey April/May 2006

Table . 4.10a Cropping pattern by land holding size in the study area in current years

Category of Land	Cereals	Pulses	Ground nut	Oilseed	Cotton	Coconut	Spices	Jiru	Fodder	Total
Marginal farmers	55	24	3	1	13	1	0	0	0	97
%	56.70	24.74	3.09	1.03	13.40	1.03	0.00	0.00	0.00	100.00
Small Farmers	47	24	12	6	10	0	0	0	0	99
%	47.47	24.24	12.12	6.06	10.10	0.00	0.00	0.00	0.00	100.00
Medium Farmers	49	33	12	1	30	0	0	0	0	125
%	39.20	26.40	9.60	0.80	24.00	0.00	0.00	0.00	0.00	100.00
Large Farmers	45	25	11	4	18	0	0	0	0	103
%	43.69	24.27	10.68	3.88	17.48	0.00	0.00	0.00	0.00	100.00
Total	196	106	38	12	71	1	0	0	0	424
%	46.23	25.00	8.96	2.83	16.75	0.24	0.00	0.00	0.00	100.00

Source: Field survey April/May 2006

Table 4.10b Cropping pattern by land holding size in the study area in 5 years ago

Category of Land	Cereals	Pulses	Ground nut	Oilseed	Cotton	Coconut	Spices	Jiru	Fodder	Total
Marginal farmers	20	8	4	0	3	1	0	0	1	37
%	54.05	21.62	10.81	0.00	8.11	2.70	0.00	0.00	2.70	100.00
Small Farmers	15	5	16	2	3	0	0	0	0	41
%	36.59	12.20	39.02	4.88	7.32	0.00	0.00	0.00	0.00	100.00
Medium Farmers	9	5	14	2	3	0	0	2	0	35
%	25.71	14.29	40.00	5.71	8.57	0.00	0.00	5.71	0.00	100.00
Large Farmers	11	8	15	1	4	0	0	0	2	41
%	26.83	19.51	36.59	2.44	9.76	0.00	0.00	0.00	4.88	100.00
Total	55	26	49	5	13	1	0	2	3	154
%	35.71	16.88	31.82	3.25	8.44	0.65	0.00	1.30	1.95	100.00

Source: Field survey April/May 2006

Table: 4.11 Use of agronomical inputs for main crops by land holding size in drought year

	Use of various agronomical inputs					
	Total HH	Simple Seed	HYV Seed	Chemical Fertilizer	Other Fertilizer	Pesticide
0. To 2.5	53	38	15	17	4	1
2.6 to 5.0	74	54	20	30	9	0
5.1 to 10	70	43	27	38	17	3
10 + above	60	42	18	29	21	1
No Land	278	0	0		0	0
Total Farmers	257	177	80	114	51	5

Source: Field survey April/May 2006

Table: 4.12 Productive Assets by land holding size

Category of Land	No. of HH	No. of Plow		No. of tractor		No. of thresher				
		Currant five	Before ten	Currant five	Before ten	Currant five	Before ten			
0. To 2.5	60	23	22	22	0	0	0	0	0	0
2.6 to 5.0	81	28	27	27	3	2	1	1	0	0
5.1 to 10	78	30	29	29	2	2	0	0	0	0
10 + above	51	28	27	27	8	6	4	2	2	1
No Land	260	6	6	6	0	0	0	0	0	0
Total	530	115	111	111	13	10	5	3	2	1

Source: Field survey April/May 2006

Table: 4.13a Loss of Harvest (agriculture produce) % loss

District	DPAP / DDP Village	0-25	25-50	50-75	More than	NR	Total
Surendranagar	DDP	0	12	9	8	33	62
%	DDP	0.00	19.35	14.52	12.90	53.23	100.00
Kachchh	DDP	2	14	1	7	79	103
%	DDP	1.94	13.59	0.97	6.80	76.70	100.00
Banaskanth	DDP	4	40	4	9	45	102
%	DDP	3.92	39.22	3.92	8.82	44.12	100.00
Junagadh	DPAP	0	27	6	13	35	81
%	DPAP	0.00	33.33	7.41	16.05	43.21	100.00
Panchmahal	DPAP	0	18	11	8	17	54
%	DPAP	0.00	33.33	20.37	14.81	31.48	100.00
Bharuch	DPAP	2	30	8	1	87	128
%	DPAP	1.56	23.44	6.25	0.78	67.97	100.00
Total		8	141	39	46	296	530

Source: Field survey April/May 2006

Table : 4.13 b Household reported total failure of crops in Drought year

District Name	DPAP / DDP Village	Yes	%	No	%	NR	%	Total	%
Surendranagar	DDP	14	22.58	14	22.58	34	54.84	62	100.00
Kachchh	DDP	10	9.71	15	14.56	78	75.73	103	100.00
Banaskanth	DDP	9	8.82	47	46.08	46	45.10	102	100.00
Junagadh	DPAP	29	35.80	17	20.99	35	43.21	81	100.00
Panchmahal	DPAP	16	29.63	21	38.89	17	31.48	54	100.00
Bharuch	DPAP	2	1.56	38	29.69	88	68.75	128	100.00
Total		80	15.09	152	28.68	298	56.23	530	100.00

Source: Field survey April/May 2006

Table. 4.14 Percentage loss of agriculture harvest by land holding size in drought period in the study area

Land Holding Size	Reported no loss	Percentage of harvest lost in the drought year				Total HH reported	Grand Total
		0-25 Percent	25-50 Percent	50-75 Percent	>75 Percent		
0. To 2.5	11	0	30	8	11	49	60
2.6 to 5.0	17	3	38	9	14	64	81
5.1 to 10	10	1	48	9	10	68	78
10 + above	1	4	23	13	10	50	51
No Land*	257	0	2	0	1	3	260
Grand Total	296	8	141	39	46	234	530

*Landless includes shared cropped households also

Source: Field survey April/May 2006

Table 4.15 District wise average production in (mun =20 kgs) per acre for all crops over a period of time

Districts	DPAP / DDP Village	Production in period	Crop wise average production in man per acre								
			Wheat	Bajri	Paddy	Juwar	Cotton	Pulses	Tomato	Mung	Math
Surendranagar	DDP	Current year	15.50	21	30.00	64.42	47.36	NR	NR	NR	NR
		Before five years	24.25	22.5	35.00	95.55	51.28	NR	NR	NR	NR
		Before ten years	26.25	24.5	40.00	116.17	52.74	NR	NR	NR	NR
		During last drought	2.00	1.5	15.00	18.83	1.57	NR	NR	NR	NR
Kachchh	DDP	Current year	24.00	9.73	5.00	12.50	NR	NR	NR	4.67	NR
		Before five years	29.00	16.63	5.00	17.92	NR	NR	NR	4.29	NR
		Before ten years	31.50	21.95	5.00	19.17	NR	NR	NR	3.92	NR
		During last drought	0.00	3.03	5.00	4.67	NR	NR	NR	3.46	NR
Banaskanth	DDP	Current year	6.00	12.88	7.88	27.50	NR	8.33	NR	5.25	6.67
		Before five years	7.50	14.88	13.13	34.33	NR	6.67	NR	6.71	6.17
		Before ten years	11.00	16.47	17.50	35.42	NR	7.67	NR	7.65	5.67
		During last drought	3.50	5.28	7.25	7.33	NR	2.67	NR	2.57	4.00

Continue

Districts	DPAP / DDP Village	Production in period	Crop wise average production in man per acre								
			Wheat	Bajri	Paddy	Juwar	Cotton	Pulses	Towar	Mung	Matih
Junagadh	DPAP	Current year	19.49	14.43	NR	22.71	37.50	NR	NR	NR	NR
		Before five years	19.96	18.43	NR	25.38	40.00	NR	NR	NR	NR
		Before ten years	22.18	20.39	NR	44.79	40.00	NR	NR	NR	NR
		During last drought	6.45	6.83	NR	5.58	3.50	NR	NR	NR	NR
Panchmahal	DPAP	Current year	9.00	NR	13.90	NR	12.00	NR	6.50	NR	NR
		Before five years	9.00	NR	15.79	NR	12.00	NR	7.31	NR	NR
		Before ten years	7.67	NR	16.58	NR	10.00	NR	7.51	NR	NR
		During last drought	4.00	NR	4.33	NR	4.00	NR	3.15	NR	NR
Bharuch	DPAP	Current year	4.17	8.88	NR	22.00	9.60	NR	6.74	2.50	NR
		Before five years	3.83	13.29	NR	22.00	10.58	NR	6.88	4.50	NR
		Before ten years	3.17	14.60	NR	22.50	10.89	NR	7.83	4.00	NR
		During last drought	1.00	1.75	NR	20.00	4.64	NR	2.65	4.50	NR
Average		Current year	14.47	12.03	12.44	30.96	15.24	8.33	6.61	3.85	6.67
		Before five years	15.46	16.79	14.50	42.98	17.19	6.67	6.74	4.73	6.17
		Before ten years	16.46	18.84	15.74	53.80	17.52	7.67	7.47	4.77	5.67
		During last drought	2.87	4.40	4.83	7.58	3.67	2.67	2.98	3.10	4.00

Source: Field survey April/May 2006

Table: 4.16a Response of farmers whether they are prepared to cope with drought situation

District Name	DPAP / DDP Village	Yes	%	No	%	NR	%	Total
Surendranagar	DDP	16	25.81	12	19.35	34	54.84	62
Kachchh	DDP	19	18.45	2	1.94	82	79.61	103
Banaskanth	DDP	31	30.39	41	40.2	30	29.41	102
Junagadh	DPAP	31	38.27	14	17.28	36	44.44	81
Panchmahal	DPAP	23	42.59	18	33.33	13	24.07	54
Bharuch	DPAP	36	28.13	10	7.81	82	64.06	128
Total		156	29.43	97	18.3	277	52.26	530

Source: Field survey April/May 2006

Table: 4.16 b Response on copying strategies of farmers during the drought season

District	DPAP / DDP Village	Grow drought resistant crops	Mix crops	Late growing crops	Less use Fertilizer	Other preparation	No other preparation	Total
Surendranagar	DDP	2	10	13	6	0	0	31
	DDP	6.45	32.26	41.94	19.35	0	0	100
Kachchh	DDP	1	13	14	9	3	1	41
	DDP	2.44	31.71	34.15	21.95	7.32	2.44	100
Banaskanth	DDP	4	26	24	9	5	1	69
	DDP	5.8	37.68	34.78	13.04	7.25	1.45	100
Junagadh	DPAP	1	9	27	9	0	1	47
	DPAP	2.13	19.15	57.45	19.15	0	2.13	100
Panchmahal	DPAP	0	18	15	11	0	0	44
	DPAP	0	40.91	34.09	25	0	0	100
Bharuch	DPAP	0	23	21	15	3	1	63
	DPAP	0	36.51	33.33	23.81	4.76	1.59	100
Average		8	99	114	50	11	4	286
		2.8	34.62	39.86	17.48	3.85	1.4	100

Source: Field survey April/May 2006

Table 4.16c Response of farmers whether their agricultural productivity declined or not.

District Name	DPAP / DDP Village	Yes	%	No	%	NR	%	Total
Surendranagar	DDP	29	46.77	0	33	53.23	62	
Kachchh	DDP	24	23.3	1	0.97	78	75.73	103
Banaskanth	DDP	57	55.88	2	1.96	43	42.16	102
	Total DDP							
Junagadh	DPAP	46	56.79	0	35	43.21	81	
Panchmahal	DPAP	35	64.81	4	7.41	15	27.78	54
Bharuch	DPAP	41	32.03	1	0.78	86	67.19	128
	Total DPAP							
Total		232	43.77	8	1.51	290	54.72	530

Source: Field survey April/May 2006

Table :4.17 Household reported regrowing of crops in Drought year

District Name	DPAP / DDP Village	Yes	%	No	%	NR	%	Total	%
Surendranagar	DDP	4	6.45	24	38.71	34	54.84	62	100.00
Kachchh	DDP	0	0.00	25	24.27	78	75.73	103	100.00
Banaskanth	DDP	3	2.94	53	51.96	46	45.10	102	100.00
Junagadh	DPAP	10	12.35	36	44.44	35	43.21	81	100.00
Halol	DPAP	12	22.22	25	46.30	17	31.48	54	100.00
Bharuch	DPAP	3	2.34	36	28.13	89	69.53	128	100.00
Total		32	6.04	199	37.55	299	56.42	530	100.00

Source: Field survey April/May 2006

Table 4.18 Crops which were sown again in order to crops with drought situation

District	DPAP / Cereal DDP Village	Pulses	Ground nut	Oilseed	Cotton	NR	Total	
Surendranagar	DDP	4	0	0	0	19	39	62
%	DDP	6.45	0	0	0	30.65	62.9	100
Kachchh	DDP	4	0	0	0	2	97	103
%	DDP	3.88	0	0	0	1.94	94.17	100
Banaskanth	DDP	45	2	0	8	2	45	102
%	DDP	44.12	1.96	0	7.84	1.96	44.12	100
Junagadh	DPAP	7	0	8	0	2	64	81
%	DPAP	8.64	0	9.88	0	2.47	79.01	100
Halol	DPAP	28	2	0	1	2	21	54
%	DPAP	51.85	3.7	0	1.85	3.7	38.89	100
Bharuch	DPAP	7	0	0	0	3	118	128
%	DPAP	5.47	0	0	0	2.34	92.19	100
Total		95	4	8	9	30	384	530
%		17.92	0.75	1.51	1.7	5.66	72.45	100

Source: Field survey April/May 2006

Table 4.19 District wise response on various problems faced in agriculture during the drought season

District Name	Lack of irrigat ion	Lack of seeds (HYV) / Fertilize r	Lack of equip ments	Lack of knowle dge about drought crops	No crop insur ance	Lack of fodder crops	Regula r crop failure	Other NR	Total	
Surendranagar	11	2	0	0	3	3	2	1	40	62
%	17.74	3.23	0	0	4.84	4.84	3.23	1.61	64.52	100
Kachchh	11	0	4	0	3	5	0	0	80	103
%	10.68	0	3.88	0	2.91	4.85	0	0	77.67	100
Banaskanth	26	7	0	0	0	5	13	0	51	102
%	25.49	6.86	0	0	0	4.9	12.75	0	50	100
Junagadh	24	9	0	0	0	0	2	0	46	81
%	29.63	11.11	0	0	0	0	2.47	0	56.79	100
Halol	16	5	0	0	2	3	3	2	23	54
%	29.63	9.26	0	0	3.7	5.56	5.56	3.7	42.59	100
Bharuch	22	1	1	2	0	2	2		98	128
%	17.19	0.78	0.78	1.56	0	1.56	1.56	0	76.56	100
Total	110	24	5	2	8	18	22	3	338	530
%	20.75	4.53	0.94	0.38	1.51	3.4	4.15	0.57	63.77	100

Table 4.20 District wise suggestion provided by farmers to tackle the drought situation

District name	Provide irrigation fertilizer	Provide loan for agriculture inputs	Provide insurance for crops	Provide training / awareness about techn. of agri.	Provide assured emp. schemes for drought periods	Nr	Total
Surendranagar	4	7	4	4	0	43	62
%	6.45	11.29	6.45	6.45	0	69.35	100
Kachchh	10	8	5	0	0	80	103
%	9.71	7.77	4.85	0	0	77.67	100
Banaskanth	33	6	11	0	0	52	102
%	32.35	5.88	10.78	0	0	50.98	100
Junagadh	2	28	2	2	0	47	81
%	2.47	34.57	2.47	2.47	0	58.02	100
Halol	7	14	4	1	2	26	54
%	12.96	25.93	7.41	1.85	3.7	48.15	100
Bharuch	16	14	0	1	0	97	128
%	12.5	10.94	0	0.78	0	75.78	100
Total	72	77	26	8	2	345	530
	13.58	14.53	4.91	1.51	0.38	65.09	100

Source: Field survey April/May 2006

Table:21 Household reported irregularity in Agriculture Income in Drought and Normal Year

Land Holding Size	Reported Irregularity of agriculture income		Grand Total	Avg. Income in Normal Year*	Avg. Income in Drought Year*
	Yes	No			
0. To 2.5	53	7	60	10925	4189
2.6 to 5.0	68	13	81	20676	8529
5.1 to 10	70	8	78	22886	9457
10 + above	48	3	51	29885	13042
No Land**	16	244	260	32625	8438
Grand Total	255	275	530	21739	8725

* Average Household Income is in Rs per year

** includes other occupation category also

Source: Field survey April/May 2006

Table.4.22a Payment of land tax of the households by their landholdings

Land holding	Payment of land Tax		Average Revenue of land tax (in Rs./HH)	Average payment made (Rs./HH)	Shortfall in land revenue/HH (in Rs./HH)
	Yes	No			
0. To 2.5	48	4	35.16	33.73	-1.43
2.6 to 5.0	66	7	58.39	57.24	-1.15
5.1 to 10	65	4	76.03	73.57	-2.46
10 + above	55	4	195.69	170.09	-25.60
No Land	14	263	83.93	89.64	5.71
Total	248	282	90.41	83.83	-6.58

Source: Field survey April/May 2006

Table . 4.23a The type of information obtained by farmers prior to scarcity work

District Name	DPAP Declaration / DDP of Drought Village	%	About relief work(Drought Scheme)	%	Information on drought resistant crops	%	NR	%	Total
Surendranagar DDP	0	0	0	0	0	0	62	100	62
Kachchh DDP	3	2.91	3	2.91	0	0	97	94.17	103
Banaskanth DDP	0	0	7	6.86	1	0.98	94	92.16	102
Junagadh DPAP	0	0	0	0	0	0	81	100	81
Halol DPAP	1	1.85	8	14.81	0	0	45	83.33	54
Bharuch DPAP	0	0	6	4.69	3	2.34	119	92.97	128
Total	4	0.75	24	4.53	4	0.75	498	93.96	530

Source: Field survey April/May 2006

Table . 4.23b The person through which information is obtained about the scarcity work

District Name	DPAP / Gram DDP Sevak Village	Sarpanch Talati	Other	NR	Total	
Surendranagar	DDP	0	0	0	62	62
%	DDP	0	0	0	100	100
Kachchh	DDP	0	5	0	98	103
%	DDP	0	4.85	0	95.15	100
Banaskanth	DDP	1	7	0	94	102
%	DDP	0.98	6.86	0	92.16	100
Junagadh	DPAP	0	0	0	81	81
%	DPAP	0	0	0	100	100
Halol	DPAP	3	0	5	45	54
%	DPAP	5.56	0	9.26	83.33	100
Bharuch	DPAP	3	7	2	116	128
%	DPAP	2.34	5.47	1.56	90.63	100
Total		7	19	7	496	530

Source: Field survey April/May 2006

Table. 4.23c The response of farmers on whether the prediction on drought proves to be correct or not

District Name	DPAP / DDP Village	Yes	%	NR	%	Total
Surendranagar	DDP	0	0	62	100	62
Kachchh	DDP	5	4.85	98	95.15	103
Banaskanth	DDP	7	6.86	95	93.14	102
Junagadh	DPAP	0	0	81	100	81
Halol	DPAP	9	16.67	45	83.33	54
Bharuch	DPAP	12	9.38	116	90.63	128
Total		33	6.23	497	93.77	530

Source: Field survey April/May 2006

Table 4.24a Response on farmers whether they received of information with guidelines or not.

District Name	DPAP / DDP Village	Yes	%	No	%	NR	%	Total
Surendranagar	DDP	0	0	0	0	62	100	62
Kachchh	DDP	3	2.91	5	4.85	95	92.23	103
Banaskanth	DDP	7	6.86	2	1.96	93	91.18	102
Junagadh	DPAP	0	0	0	0	81	100	81
Halol	DPAP	4	7.41	4	7.41	46	85.19	54
Bharuch	DPAP	3	2.34	4	3.13	121	94.53	128
Total		17	3.21	15	2.83	498	93.96	530

Source: Field survey April/May 2006

Table 4.24 b The types of guidelines obtained by farmers along with drought prediction information

District Name	DPAP / DDP Village	Declaration on employment schemes	Fodder availability	Others	NR	Total
Surendranagar	DDP	0	0	0	62	62
%	DDP	0	0	0	100	100
Kachchh	DDP	3	0	0	100	103
%	DDP	2.91	0	0	97.09	100
Banaskanth	DDP	5	0	1	96	102
%	DDP	4.9	0	0.98	94.12	100
Junagadh	DPAP	0	0	0	81	81
%	DPAP	0	0	0	100	100
Halol	DPAP	5	0	0	49	54
%	DPAP	9.26	0	0	90.74	100
Bharuch	DPAP	1	2	0	125	128
%	DPAP	0.78	1.56	0	97.66	100
Total		14	2	1	513	530
		2.64	0.38	0.19	96.79	100

Source: Field survey April/May 2006

Table 4.25a Do you receive contingency plan for crop cultivation during the drought season?

District Name	DPAP / DDP Village	Yes	%	No	%	NR	%	Total
Surendranagar	DDP	0	0	19	30.65	43	69.35	62
Kachchh	DDP	1	0.97	8	7.77	94	91.26	103
Banaskanth	DDP	2	1.96	9	8.82	91	89.22	102
Junagadh	DPAP	0	0	32	39.51	49	60.49	81
Halol	DPAP	3	5.56	4	7.41	47	87.04	54
Bharuch	DPAP	0	0	9	7.03	119	92.97	128
Total		6	1.13	81	15.28	443	83.58	530

Source: Field survey April/May 2006

Table 4.25b The types of information available from Government

District Name	DPAP / DDP Village	Crop Planning	%	Use of Fertilizer	%	NR	%	Total
Surendranagar	DDP	0	0	0	0	62	100	62
Kachchh	DDP	0	0	0	0	103	100	103
Banaskanth	DDP	2	1.96	0	0	100	98.04	102
Junagadh	DPAP	0	0	0	0	81	100	81
Halol	DPAP	2	3.7	1	1.85	51	94.44	54
Bharuch	DPAP	0	0	0	0	128	100	128
Total		4	0.75	1	0.19	525	99.06	530

Source: Field survey April/May 2006

Table 4.25c Information availability through various person

District Name	DPAP / DDP Village	Gram Sevak	%	Agriculture Department	%	NR	%	Total
Surendranagar	DDP	0	0	0	0	62	100	62
Kachchh	DDP	0	0	21	20.39	82	79.61	103
Banaskanth	DDP	2	1.96	0	0	100	98.04	102
Junagadh	DPAP	0	0	0	0	81	100	81
Halol	DPAP	4	7.41	0	0	50	92.59	54
Bharuch	DPAP	0	0	0	0	128	100	128
Total		6	1.13	21	3.96	503	94.91	530

Source: Field survey April/May 2006

Table 4.26a Response of farmers whether they are aware about government programme.

District Name	DPAP / DDP Village	Yes	%	No	%	NR	%	Total
Surendranagar	DDP	0	0	19	30.65	43	69.35	62
Kachchh	DDP	9	8.74	4	3.88	90	87.38	103
Banaskanth	DDP	20	19.61	2	1.96	80	78.43	102
Junagadh	DPAP	0	0	28	34.57	53	65.43	81
Halol	DPAP	2	3.7	0	0	52	96.3	54
Bharuch	DPAP	16	12.5	6	4.69	106	82.81	128
Total		47	8.87	59	11.13	424	80	530

Source: Field survey April/May 2006

Table 4.26b Response of farmers on awareness of government programme

District Name	DPAP / DDP Village	Relief work	%	Cattle Camp	%	Low price of Fodder	%	NR	%	Total
Surendranagar	DDP	0	0	0	0	0	0	62	100	62
Kachchh	DDP	4	3.88	5	4.85	0	0	94	91.26	103
Banaskanth	DDP	6	5.88	6	5.88	8	7.84	82	80.39	102
Junagadh	DPAP	0	0	0	0	0	0	81	100	81
Halol	DPAP	2	3.7	0	0	0	0	52	96.3	54
Bharuch	DPAP	15	11.72	1	0.78	0	0	112	87.5	128
Total		27	5.09	12	2.26	8	1.51	483	91.13	530

Source: Field survey April/May 2006

Table 4.27 The farmers' awareness on various types of government activities

District Name	DPAP / DDP Village	Drought resistant crops	Demonst ration plot	Training for agri.	Watershed / water harvesting schemes	Khet Talavadi	NR	Total
Surendranagar	DDP	0	0	0	0	0	62	62
%	DDP	0	0	0	0	0	100	100
Kachchh	DDP	0	4	0	0	0	99	103
%	DDP	0	3.88	0	0	0	96.12	100
Banaskanth	DDP	1	0	0	1	1	99	102
%	DDP	0.98	0	0	0.98	0.98	97.06	100
Junagadh	DPAP	0	0	0	0	0	81	81
%	DPAP	0	0	0	0	0	100	100
Halol	DPAP	0	0	1	0	3	50	54
%	DPAP	0	0	1.85	0	5.56	92.59	100
Bharuch	DPAP	0	0	0	0	0	128	128
%	DPAP	0	0	0	0	0	100	100
Total		1	4	1	1	4	519	530
		0.19	0.75	0.19	0.19	0.75	97.92	100

Source: Field survey April/May 2006

Chapter Five

**Droughts, Vulnerability and
Human Development**

Chapter Five

DROUGHTS, VULNERABILITY AND HUMAN DEVELOPMENT

Introduction

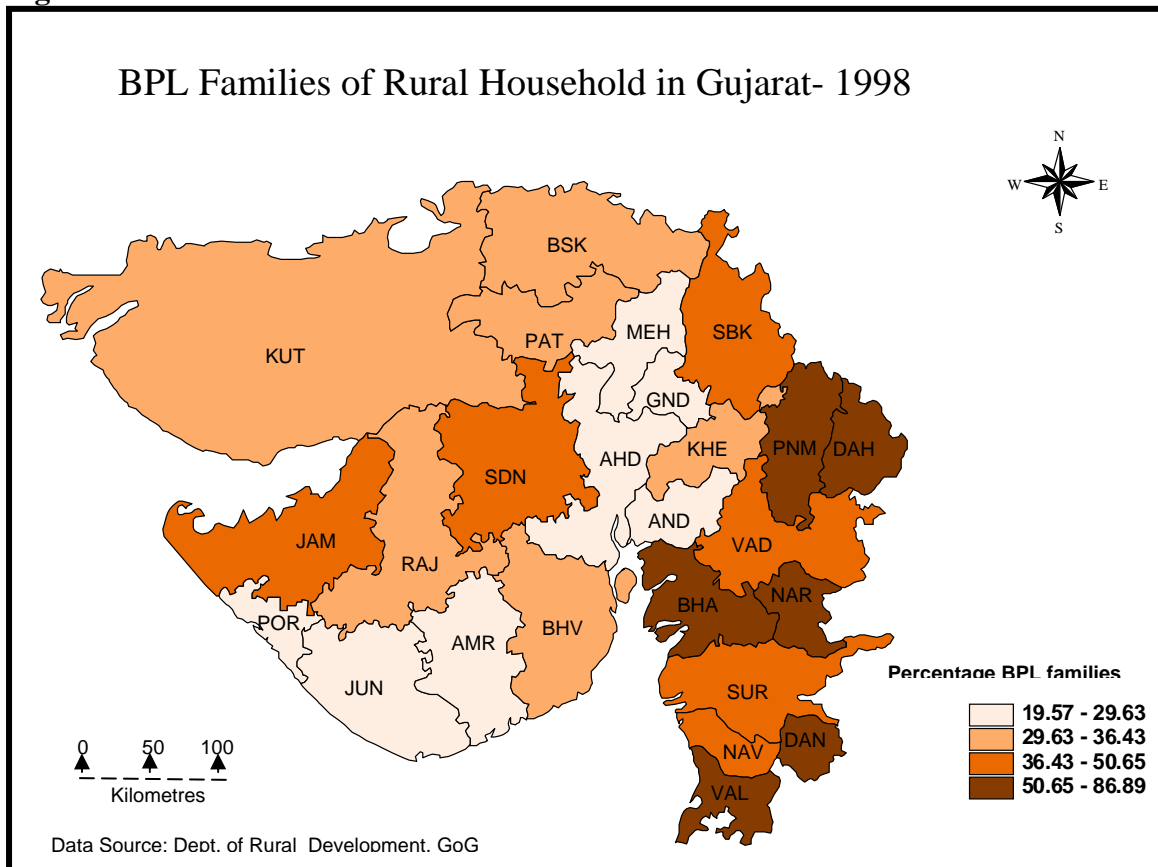
Impacts of drought on agriculture have resulted in general backwardness of population in drought prone areas in Gujarat. Severity and regularity of drought conditions in these areas made large population more vulnerable to the risk of drought. Declining agriculture productivity due to drought has badly affected household income. Distribution of agriculture income across drought regions shows abysmal picture. A very low level of household income has been reported from desert (DDP) and drought prone (DPAP) villages. Various other reports indicate that poverty is concentrated in dry regions of the state. The drought and drought prone area are less diversified, dominated by agriculture, agriculture labours and other rural laboures. It has also been observed that poverty is higher in agriculture labours and in tribal regions (Challaya, 1999). Thus, the population in desert and drought prone areas of Gujarat are more vulnerable to natural calamity especially to drought. Their traditional coping strategies also make them more vulnerable due to lack of assistance from government agencies and others development agencies.

The linkages between drought and various kinds of vulnerabilities i.e. economic, social, physical are well established in development literature. However, the present study focuses on the economic, social and environmental vulnerability of the people living in drought regions of the state. Economic vulnerability has been measured in terms of percentage of population living below poverty line at district level (DDP & DPAP) districts. Social vulnerabilities has been assessed in terms of indebted, out-migration, sale of assets and various other kinds of coping strategies adopted by the population in drought regions. Overall vulnerability has been compared across the desert, drought prone areas and others areas of the state.

Poverty in Drought regions of Gujarat

Income poverty has been expressed in terms of percentage of population blow poverty line (BPL-family). Government of Gujarat has conducted a survey of BPL family across the districts of Gujarat during 1998-99 (See Table 5.1 in annexure). District level data on income poverty reveals striking features of regional concentration of poverty (See Figure. 5.1). Southern (districts) and eastern tribal districts constitutes majority of BPL families.

Figure 5.1



These districts here covered under DPAP areas. Panchmahal, Dahod, Narmada, Bharuch, Vansad and Dang have reported 50 to 80 percent of their total household below poverty line. All these districts are covered under drought prone development programme in the state. Sabarkantha, Valsad, Surat, Navsari, Surendrabagar and Jamnagar reported 36 to 50 percent of their total household (families) are under BPL category. It should be noted that except Surat all other districts are covered under area development programmes to reduce the impact of drought and desertification in the state. Rest of the districts reported BPL families in the range of 19 per cent to 36 per cent. Thus most of the districts with high incidence of poverty belong to drought and desert regions in Gujarat.

Table 5.2 shows percentage of BPL families in the DDP, DPAP and Other non-DDP +DPAP districts. BPL family data has been obtained by the government of Gujarat in 2000. Hence districts level data on BPL families has been adjusted, taken out number of DDP (2 district) and DPAP (8 districts) from the 19 districts of Gujarat. Then a separate table has been prepared to get on idea about the percentage of BPL families in drought (DDP) and drought prone (DPAP) areas in Gujarat. As the district level data reveals that poverty in Gujarat has been concentrated in Southern and eastern tribal delts, these areas are also covered under DPAP areas. Data reveals that 67% of the total family in DPAP districts are below poverty line, while more than 56% of total families of DDP districts fall under BPL categories. Rest of the districts have registered comparatively lower percentage of BPL families of 46%. As per the government of Gujarat more than 54% of

total families of (household) fall below poverty line. This is a higher reporting of poverty as other sources of data especially NSSO and planning commission do not confirm it. Nonetheless, a regional picture emerges out of this data, as it indicates a higher concentration of income poverty in desert and drought prone areas in the state. There has been substantial reduction of rural poverty in Gujarat during 1987-88 –1993-94 periods as per NSSO data. Regional scenario of BPL population as per NSSO data has been presented here to assess the concentration of income poverty in different regions of Gujarat.

Income Poverty in Rural Gujarat

Rural poor constitute the major chunk of the poor by most estimates. According to most experts (Drèze and Deaton 2003, Dev and Ravi 2003, Bhalla 2003 and Datt, Kozel and Ravallion 2003), the incidence of rural poverty is higher than the incidence of urban poverty in the state. According to the Planning Commission's estimates also the rural poor constitute 64 per cent of the total poor in the state. Among the rural poor, the poorest are agricultural and rural labourer particularly belonging to SC and ST communities. In fact, agricultural and rural labourers belonging to the scheduled tribes are the poorest lot in the state. Other poor groups in rural areas are marginal farmers and artisans, followed by small farmers mainly in arid areas.

As far as regional dimension of poverty is concerned, the tribal region is the poorest region in the state (1993-94) (Table 5.3). This is followed by Gujarat Dry Region in the North. This seems to be due to the low wage rates and the drought proneness of the regions. There is massive seasonal/temporary out migration from this region to other regions.

Saurashtra and Kachchh are the least poor regions with 18.80 per cent incidence of poverty. The incidence of rural poverty in this region is 10.03 per cent, mainly due to the high wage rates (predominant cash crops), low population density and its 'money order economy', i.e. incomes received from migrant workers in distant urban centres like Surat, Mumbai, Ahmedabad, and so on and countries in Africa, America, and Europe. Income poverty often makes rural household more vulnerable to any natural calamities particularly during droughts in dry land in Gujarat

Household Vulnerability in Drought and Drought Prone Areas in Gujarat

Income Poverty and Household Vulnerability

Field survey conducted during April / May, 2006 reveals vulnerable characterizes of household in both DDP and DPAP villages. household characteristic in terms of occupations categories, poverty and caste has been presented in Table 5.4. Distribution BPL household by caste groups across various occupation categories reveal vulnerable characteristics of population in drought and drought prone areas in Gujarat. Out of 530 household survey in both DPAP and DDP districts in 12 villages, 210 household reported having registered BPL card holders. That means about 40% of the total household in drought prone areas are poor. Amongst the major cast groups ST are the poorest in Gujarat's drought regions with more than 50% of the total household of them falling the below poverty line. They are followed by SC with 39% of their household reported being

BPL, while others have also reported equal percentage of families under BPL category. Our primary survey puts OBC in marginally better positions as far as their BPL household is concerned. Only about 37% of the total household of OBC reported below poverty line.

Amongst the major occupational groups agriculture labour reported highest number of BPL families followed by agriculture household, thus it is observed that poverty is concentrated in agriculture labours and also in farmers community whose main occupation is agriculture and allied activity. Other vulnerable occupation groups in terms of poverty are other laboures and rural (village labours). Hence, drought regions of Gujarat, witnesses vulnerable characteristic of population, in terms of highest incidence of poverty, poor diversification of economic activities and vulnerable lower coste population that shows highest percentage of poor population below poverty line. Income poverty leads to more vulnerable situation of population in the long run.

Poor and vulnerability

As mentioned above that 40% of the total household surveyed belongs to BPL families, however, severe lack of support to them has been observed (See Table 5.5). Access to benefits which are given to BPL families has been very poor as only 56 household (27%), out of 210 BPL families has reported taking any benefits from various governmental schemes. Out of these 56 household only 20 household were reported given “House plot” to build houses for them, while 43 household were given house under Indira Awas Yogana¹. Only one BPL household has so far reported having loan for self employment. Lack of economic opportunities due to less diversified economic activities makes these people more vulnerable in drought regions of Gujarat. Lack of economic opportunities leads to various kind of vulnerability. Rural household tends to minimize certain vulnerability by saling their assets. One of the easiest assets to sale is the land in rural areas in drought prone regions of Gujarat. In case of household crisis (be it economic or other wise) rural household in dry regions have various system of land related transactions. Table 5.6 presents the system of land mortgage, sale, lease out and lease in of agricultural land by the size of land holdings. Out of a total 270 household that have land holdings of various size, 25 households reported sale of their land assets due to financial burden, while 28 household reported mortgaging their agriculture land in lieu of money for personal expenditure. 14 household reported leasing out their land, whereas 7 household reported taking leased in land from other farmers. There is less variations of these land transaction across (different) landholding size. However, none of the marginal farmers are able to lease in any land. They are more vulnerable compared to others. Farmers decision to sale land largely depends on their social obligation and also for support to farming (productive need) etc.

Table 5.7 shows reasons for sale of land assets by farmers in drought and drought prone areas in Gujarat. One of major reasons for the sale of land is the shifting of household (migration) from the villages to other places. Out of 25 household that reported sale of land, majority of them (20HH) reported shifting or out migration as a reason for saling their part of agriculture land. Social events such as daughter’s marriage and other

¹ Indira Awas Yogans, provides housing to rural BPL families, under central govt scheme. Contribution of poor is also required to avail these benefits.

function and payment of debt were other reasons. Only one large farmer household reported sale of their land parcel to meet household expenses. This indicates vulnerable conditions of farmers. Sale of their land holding due to shifting/ out migration has also been reported by medium and large farmers in these areas.

Economic compulsion resulting in sale of land asset makes farmers vulnerable. Land assets provide supports for agriculture and allied activities especially animal husbandry. Table 5.8a shows numbers of household with livestock in all the 12 villages as per their landholdings size. One of the most striking observations is that almost 50% of the household that reporting having livestock belongs to landless categories. This indicates the practice of domestication of milch animals by other occupational groups with or without having any agricultural land. The landless household heavily rely on the farmer for fodder and other requirements for animal rearing. This leads to heavy pressure on the “Gohchar”² lands as animals belonging to landless household thrive on these lands. More than 52% of the total household in drought and drought prone areas of Gujarat reported having livestock. Amongst these, small and medium farmers dominates. They also substantiate their household income through these activities. However, the average size of the land holdings across these farmers varies substantially. Table 5.8b shows average land holdings of farmers in the dry regions of Gujarat. The average landholding of marginal farmers is 1.25 acres only, while it is 3.54 acres for small farmers. Average land holding per household of medium farmers has been found to be 7.11 acres. However, large farmers have been showing really large land holding size. They on an average own 19 acres of land. Thus, a substantial variation in ownership of land has been observed in these areas of Gujarat. The lower land landholding of marginal and small farmers also make them vulnerable during natural calamity particularly during droughts. Land holdings determine the income levels of the rural household and in terms it also suggests the general levels of livings. However, it has been observed that there is a severe lack of household facilities in rural areas in drought regions.

Vulnerability in the Levels of living

Vulnerability in terms of levels of living has also been observed across all occupation groups. Levels of living have been expressed in terms of household facilities such as having own house, electricity connection to house, tap water supply, and sanitation facilities. Water and sanitation facilities have not been adequate for all the household surveyed. Table 5.9 shows household facilities, across the occupational groups in drought prone areas in Gujarat. Out of 530 household surveyed 513 household reported having their permanent house in their villages. The rest of the 17 households either share their houses with close relatives or has temporary arrangements. In terms of household facilities, 385 household (73%) reported having electricity connection for lighting purposes, while 165 (31%) household have tap water supply. Household sanitation by and large has been poor in drought and drought prone areas in Gujarat. Only about 20% of the total household surveyed reported having bathroom facilities in their house, while only 18% have toilet facilities inside their houses. Rural water supply and sanitation have

² Gohchar- Grazing and pasture land in villages. This is a common property resource of villagers in dry regions of Gujarat.

been very poor in the state, however, its quite sticking in dry and drought prone areas in Gujarat. Again the most vulnerable groups of population is agriculture labour with very poor household facilities some of them even lack housing as they are managing with their relatives or having temporary shelter in their respective villages. In case of drought, these households suffer a lot due to lack of shelter. Other vulnerable groups in terms of household facilities particularly lack of sanitation were those with exclusive animal husbandry and fisheries. However, these are not so significant.

Economic Vulnerability

Change in Occupational stature

Low level of economic diversification characterizes the people living in drought areas of Gujarat. This could be considered as economic vulnerability of household as few changes in their overall occupational structure have been observed. Table 5.10 shows changes in overall occupation structure in these villages in DDP and DPAP districts. A marginal change in overall occupational structure has been observed at household level in the entire village surveyed. Number of household shown declined in agriculture, agriculture laboures, other laboures and village labouers during the last decade. The reduction of household in these activities has been quite visible during last five years. This is attributed to the overall sift in major occupation at village level. One of the striking observations is that there has been decline in the number of households employed in government services. One recent phenomenon has been noticed that family workers are engaged in home based activities for self employment. Overall shift of occupation by and large indicate dominance of primary activities, including animal husbandry and fishery. Other activities include village artisans, self-employed and those who are engaged in other commercial activities.

Poor diversification coupled with slow change in occupation structure has lead large population to depend on primary activities, which are generally supported by natural resources available to them. As the impact of natural calamity on resource base of population has been observed, people living or depending on those natural resources get severely affected. Since majority of people depends on primary activities in drought areas of Gujarat, their physical and economic vulnerability is a serious matter for policy makers and planners. Drought proofing and mitigation initiatives need to take this vulnerability into account. Piecemeal approach to drought relief may not be a viable solution in the long run. Only long term measures, to rejuvenate the village natural resource base will help tackle the scourge of drought (Rajendra 2001). One of the major causes of economic vulnerability of people in dry / drought areas of Gujarat is their high indebtedness. Debt cycle becomes vicious code for them, which they can not over come by their own, as these population are economically quite vulnerable.

Indebtedness of people in drought areas

Rural household particularly in drought and drought prone areas of Gujarat reported high debt burden for social obligations. Table 5.11 shows debt burden of household by their occupation categories at present, five years ago and 10 years ago. This data may not be cent percent reliable as 10 years recall period is too long to get correct response as most of debt transaction are done through informal means. However, household debt through

formal transaction i.e. thought formal sources such as bank, cooperatives etc are good enough for estimation as well for measuring the debt of rural household in dry areas of Gujarat.

Out of total 530 households surveyed, currently 129 households reported having debt burden of various kinds. Thus in other words about 25% of the total households reported heavy to lower burden of indebtedness. One of the striking observations in that the number of households with indebtedness has increased sharply in last 5 years. There were only 5 and 3 percent households with some or the others kinds of debt five years and 10 years ago respectively. However, their average debt burden has shown marginal decline. Indebtedness makes rural household vulnerable in the sense that they are always trapped in debt burden due to lack of capacity to repayment. It has been also observed that (over the years) that tendency of debt is seen in all the occupation groups, currently, however, this was not the case 10 years ago. Not only the number of households with debt burden has increased but they are also spread over to all occupational groups, (see table 5.11). This clearly indicates vicious cyclic nature of debt burden across all the occupational groups. One reason for this could be informal sources of debt with higher rate of interest.

Sources of Debt

If one examines the sources of the debt of household, majority of them have taken (debt) loan in monetary (value) from co-villagers / money lenders. Table 5.12 shows the various sources of debt of household for social obligation. The informal debt transaction has led to high rate of interest making repayment of debt almost impossible for villages in drought regions of Gujarat. Out of 129 households that reported debt burden, 83 of them (64%) have taken financial loan from their co-villagers and money lenders with rate of interest as high as 19% per annum. Another major source of private loan has been the close relatives, who either give money with or without interest. However, they sometime also repay with higher interest. Cooperatives Banks and formal government sector banks are also one of the main sources of the loan for the rural household. Here again the most vulnerable groups are the first 4 occupational categories (see table 5.13). Majority of them have taken loan from moneylenders with high interest rate.

Reason for debt

Amongst the various reasons, social events (of marriage, death etc.) has been the reason for majority of the household that have fallen into debt trap. Out of 129, 88 households reported social events of various kinds as the main reason for their indebtedness. 33 households took debt for making their own house or for the repair of their houses, while 6 households reported their indebtedness due to illness in their household. 2 households each from agriculture and other labourers household took loan for the purchase of vehicle. Thus it is observed that social obligation becomes major reason for household debt in drought areas rural Gujarat.

However, a good number of people have also taken loan for the agriculture purposes. Table 5.14 shows number of household reported debt burden due to agriculture purposes by occupational groups. Out of 530 households, 99 households reported having debt due to various requirements for agriculture purpose. They also reported high interest rate of 13% which is comparatively lower than those taken for social events. This can be attributed to the fact that agriculture loans are more formalized and are generally

available from the formal banking institutions largely by the government banks. However their average household debt is slightly higher than those taken for social events. On an average each of the 99 households reported debt burdened of Rs. 48 thousand, with an average rate of interest of 13%. Out of 99 households, 85 households reported debt due to various requirements of agriculture inputs, while 7 household took loan for agriculture implements (equipments) and 6 households reported debt for the purchase of cattle as majority of these households belongs to agriculture household. In other words about 65% of those households with debt belong to agriculture household.

Loan for agriculture purposes are generally taken from cooperative banks in rural areas in Gujarat. The major sources of loan for agriculture purpose is cooperation banks as 77 households (out of those 99) have taken loan from these institutions. 7 households reported haring loan from government banks, while 15 households reported the source of their debt as co-villages / money lenders (see Table 5.15).

One of the striking observations about the indebtedness of people, particularly farmers household is that agriculture debt burden is higher than those of social events. However, loan (taken) for social events are generally taken from informal sources with high interest rate, whereas, agriculture loans are more formalized, hence farmers comparatively repay these loan with lower interest rate. Thus it indicates that agriculture has not been a viable economic activity in drought and drought prone areas in Gujarat. People particularly farmers in these areas are highly burdened with debt, which makes them vulnerable in long run as repayment became almost impossible due to regular crop failures during drought period.

Household Savings in Drought Prone Areas in Gujarat

Household savings has also been reported despite indebtedness in drought regions however, these savings are very less to provide them relief from indebtedness or to help them in crisis particularly from drought. Table 5.16 shows household saving across occupational groups in these areas. Out of 530 households surveyed, 94 households reported some saving either in cash or in kinds especially in ornaments³. In other words only about 18% of the total households have been able to do some savings out of their small incomes in drought prone areas of rural Gujarat. Amongst the major occupation groups, agriculture labours have reported least number of households (9%) with any kinds of savings, followed by village laboures and other labours with 12 and 13% of their households reported any saving. 40% of households doing animal husbandry having reported savings, which is highest reported by any occupational groups in there areas. They are followed by the household belonging to government service, agriculture and those with private services. This indicates that agriculture with animal husbandry helps rural household with some saving that reduces their vulnerability in the crisis.

If one examines the sources of savings, it is the traditional mode of savings that top the list. Out of 94 households that reported savings, 88 households reported savings in terms of “ornaments,” savings in cash has been reported by 35 households with their sources in cooperatives, other banks and rural post office (see table 5.16). Majority of them (21

³ HH ornaments are generally made out of precious metal like gold, silvers etc.

households) reported having savings in cash in other nationalised and private formal banks. Only 2 households reported savings in post offices in these regions.

Accumulation of Savings

It has also been observed that the amount of saving in these household is increased in last decade. Table 5.17 shows actual savings of household across different occupation category with their sources. The average amount of saving with cooperative banks has been found Rs.81,375 at present (currently) while it was Rs. 55,500 five years ago, and Rs. 25,500 10 years ago. Approximate value of ornaments were asked by the household and they reported saving in term of monetary value of the total ornaments with them. Table 5.17a shows average estimated value of household's ornaments by occupational groups during last 5 and 10 years. There were 88 households currently which reported saving in ornaments while, there were 52 and 45 households during 5 and 10 years ago. Their average estimated value of saving were Rs. 13534, Rs. 14865 and Rs. 10178 at present, 5 year ago and 10 years ago respectively. This indicates slight improvements in households saving in ornaments during the last decade. However, these amounts are too little to help them during household crisis either natural (like drought & flood) or health related crisis. Again the most vulnerable groups in terms of household savings is agriculture labourers, which are in majority in drought and drought prone areas of Gujarat.

High indebtedness and low savings have been observed across the various occupational groups particularly those engaged with primary activity. It should be noted that more than 90% of population are engaged in activities such as agriculture, agriculture labour, rural labourers, animal husbandry and fisheries. This indicates their economic vulnerability which leads to a large extent of out migration of people from drought and drought prone areas of Gujarat.

Out –Migration from Drought areas in Gujarat:

Large scale out-migration has been observed in desert and drought prone areas in Gujarat. This has been a typical phenomenon of any dry land across the world as these areas are primarily an area of push factors for migration. As mentioned in earlier chapter that almost 17% of the total households seasonally out migrate in search of employment either in normal year or in drought year. Table 5.18 shows percentage of household out migrating (seasonally) by their occupational groups in drought prone village in Gujarat. Significant variation occurs across the villages in DDP areas particularly villages in Surendranagar (Gangad 71% and Kalam 48%), district reported higher percentage of household out migrating seasonally followed by Junagardh district. Seasonal out migration has also been high in Panchmahal district with Kherap villages reporting 24% and Kansaravav 17% of their total households out-migrating seasonally.

Banaskantha, Bharuch and Katch reported comparatively lower out migration. Least migration has been reported from Bharuch district (DPAP) with Ankhi (13%) and Delhi (12%) of their households reported out migrating. Amongst the occupational groups, agriculture labourers are mostly out-migrating. They are the most vulnerable groups in dry regions of Gujarat. They are followed by agriculture household and other labourers. Rest of the other occupational groups reported very low out migrations (see Table 5.19).

Nature of Migration

The extent of migration in terms of family members out migrating with working adults has been also found high in the drought prone areas. Table 5.19a shows household reporting out migration with their family members. Out of 530 households 83 households reported out migration from their native villages with entire their family members. District level variation has been also been observed. In another words 16% of the total households out migrate with their family members. However, Surendranagr districts (DDP) reported maximum number of households about (52.46) of its total households migrating with their family members, followed by Bharuch and Panchmahal with 22% and 13% of their households out migrating respectively. Thus a higher number of households reported out migration with their family members.

This indicates the support of family workers for employment while out migrating for jobs. It has been also observed that leaving behind their family member during lean agriculture period is difficult as other family members (general women & children) may not be able to sustain themselves. Since, they migrate seasonally along with their family they usually migrate to the nearest place of employment opportunity.

Coverage Areas (Commuting Distance) of Migration from Drought regions

Table 5.20 shows coverage of area of out migration from the drought and drought prone areas in Gujarat. Out 17% households that out migrates seasonally for employment 11.35 migrate to outside their district, while 5.31% of them migrate within their districts. However, a few household reported migrating outside the state. This indicates a distress nature of migration, where majority of households migrate to nearby districts and towns. A significant variation has been observed across these districts both in DDP and DPAP. In case of short distance migration, Malondha (Junagadh) reported 23% of its total households migrates within the same districts for employment, followed Badalpur village of the same district with 10% of its total households migrates within the district for employment. Dehri (Bharuch) reported 8% of its total households out migrating within the districts.

In case of DDP areas, Moti Sindhodi (Kutch) reported slightly higher percentage (10%) of its total households migrating within the district. Rest of the other districts reported less number of household for short distance migration. Thus, the district of Kutch & Junagadh have reported short distance migration compared to rest of the other district.

In terms of long distance migration i.e. household migrating outside their own districts, DDP districts of Surendranagar (mainland) reported highest percentage of household (Gandad and Kalam reported 65% and 43% of their total household) migrating out side their district largely distressed in search of employment. Other districts that reported higher percentage of out migration out side the district is Panchmahal. Kansaravav (16%) and Kherap (20%) of Panchmahal district reported higher percentage of out migration DPAP districts. Thus the distressed migration has been found higher in Surendhranagar (DDP) and Panchmahal (DPAP) districts. Limbala in Banaskantha (DDP) district has also reported 10% of its total households migrating outside of the district. Very few households reported out migrating outside the state. Thus it indicates that Gujarat has been grossly a place for in migration due to higher diversifican of economic activities. However, a significant cases of distressed intra-state migration in

search of employment has been observed. These household not only migrate in distress for the search of employment seasonally but they also migrate to rural areas only. The agriculture household that constitutes majority of migrants household migrates to other villages for the search of employment. The seasonal nature of employment in agriculture can be attributed to this fact.

Regional destination (Rural/Urban) of Migration

Table 5.21 shows seasonal migration of household to rural and urban areas in this region. Out of total 17% households which migrate, 10% migrate to other rural areas, while 7% migrate to urban areas, thus indicating a seasonal nature of migrations which are dominated largely by the agriculture labours. Regional variation has also been observed. Surendranagar districts (DDP) has reported higher percentage of household migration to rural areas followed by Panchmahal districts (DPAP). Junagadh (DPAP) districts was also reported higher percentage of household (Malondha , 20% and Badalpur, 14%) migrating to rural area only.

In case of out migration to urban areas, again Surendranagar reported higher percentage of household followed by Panchmahal districts. Rest other districts has reported comparatively lower number of household migrating to urban areas. This indicates a distressed seasonally migration which is non-sustainable as majority of them migrate to rural areas where employment opportunity are not only less but are very much seasonal in nature. Therefore, the short distance migration compels rural household to migrate with their family member to support their livelihood during the period of migration.

Table 5.22 shows nature of migration by the household in the selected villages in DDP and DPAP districts. Out of 17% of the total migrating households about 9% migrates with family, 5% of them reported only male members migrating and almost 3% of the total households that migrates reported taking all adults with them. Only female members out migrating are reported very less, which is not significant. However a significant variation has been observed across the villages in the nature of migrations. Again Surendranagar (Gangad 50.55% and Kalam 30% of their total households) reported migrating with their entire family. Panchmahal district again followed with Kherap 15% (of its total households) and Kansaravav 12% (of its total households) reporting out migrations with their entire family members. It is however, also important to understand the seasonality of migration in terms of total duration of migration of these household in Dry land of Gujarat.

Seasonality (Duration) of Migration

Table 5.23 shows seasonal duration of migration across the villages in DDP and DPAP districts. Seasonal nature of migration has been observed in terms of total duration of migration of household. More than 5% of the total household migrates seasonally only for 3 months, while about 6% of the household migrates for 4-6 months in a year for employment. Rest of the other household that migrates (more than 5%), they are long term migrations and their total duration varies between 6 months to a year. However, high seasonal migration has been observed in Surendranagar (nearly 41% of the total household) districts with 6 months duration followed by Panchmahal districts. Surendranagar has also reported higher number of household migrating for longer period of times. Thus long terms migrations have been observed more in DDP villages than that

of the DPAP. However, depopulation has not been observed so far amongst these villages.

Out Migration and Vulnerable Groups

A cross sectional analysis has also been done to see the nature of migration across vulnerable groups in drought prone areas in Gujarat. The nature of migration in terms of migrating with family member, distance or area coverage of migration, destination in terms of rural urban regions and duration of migration has been examined across, occupational groups, landholding size class and caste groups of household in these areas. As seen earlier in Table 5.19 that relatively more vulnerable group in terms of migration as per occupation are rural labours (including agriculture labour and other labour) and agriculture and animal husbandry household. However, it is the agriculture labours which are more vulnerable as majority of them migrate with their entire family (see Table 5.24). Agriculture labours have reported highest number of their household out migrating with family, only male members, only adults and only female. This indicates the nature of distress migration where in entire family members migrate in search of job. These valuable groups particularly agriculture labours, other laborers and agriculture household largely migrate to other districts in the state. They generally migrate to other districts where relatively less impact of droughts are left (see Table 5.25) as majority of them again migrate to rural areas only for the research of agricultural jobs. Thus, it indicates distress nature of seasonal migration, where agricultures and other rural labours migrate to other districts (or better district) which has less or no drought (see Table 5.26). In terms of duration of their migration, it is seasonal and majority of them migrate for 4-6 months during different agricultural seasons in a year (see Table 5.27).

Migration by Farmers

Other vulnerable groups in terms of out migration from drought prone areas in Gujarat is the landless household and majority of them constitute agriculture labour, rural labours and other labours. Similar pattern in terms of various aspects of migration has also been observed in household with landholding sizes. About 53% of the total household that out migration belongs to landless groups followed by marginal farmers. However, a considerably number of other landholdings groups also out migrates in search of jobs. (See Table 5.28). These vulnerable groups i.e. landless and marginal farmers by and large out migrate with their family due to lack of support at their place of residence. In terms of destination of migration majority of them about 65% migrate to other districts within their state, followed by 31% which migrates to another areas in the same district. This pattern holds true across the all landholding size groups (See Table 5.29).

Majority of these household about 58% of those out migrates, they migrate to another rural areas either within their own district or to another district. About 40% of the household migrate to urban centres within Gujarat (See Table 5.30). However, an interesting observation is that majority of medium and large farmers that migrates goes to urban areas as compared to other landholding groups. Large farmers by and large migrate to urban centres in search of job.

Duration of migration has also been assessed across landholding groups. Majority of those household migrate for 6 months in a years. Again long terms migration has been

observed in case of large and medium farmers (See Table 5.31). Vulnerability across caste groups has also been observed as far as migration concerned.

Migration by Major Caste Groups

Out of a total out-migrating HH of 480, 60 belong to OBC groups followed by 22 SC and 10 of ST groups. Other caste that constitutes mostly the higher caste by and large does not migrate much. Only about 7.5% of the total out migrating household belongs to other caste groups (See Table 5.32). However majority (about 49 %) of them migrate along with their families. This pattern of nature of migration holds true across all the caste groups and across all the category (vulnerable) group of drought prone in desert areas in Gujarat (See Table 5.33, 5.34 and 5.35).

Status of Human Development in Dry lands of Gujarat

Regional Variation in Attainment of Education

There are regional variations in educational attainment in Gujarat according to the latest NSS data (1999-00). The dry region located in the north and northwest and the eastern tribal belt are two main problem regions. Literacy rates in the dry region (comprising the districts of Banaskantha, Kachchh, and Surendranagar, and Sami, Harij and Chanasma talukas in Mehsana) are the lowest, 41.30 per cent for females, 69.89 per cent for males, and 56.11 per cent for both (Table 6.4). Then comes the eastern region, which is the tribal region, which also has low literacy rates; 45.60 per cent for females, 67.38 per cent for males, and 56.50 per cent for both (1999-00). Between 1993-94 and 1999-00, the overall literacy rate has increased only marginally, by 3.0 percentage points in the tribal region and it has **declined** by almost 4 percentage points in the dry region! The increases achieved in other regions are quite low and not very impressive.

Status of Children's Education in dry regions of Gujarat

NSSO present its latest data on the access to school education across various regions in Gujarat during 1993-94 and 1999-00. Table 5.37 shows enrolment rates of children aged 6-14 by NSS regions in Gujarat during 1999-00 and 1993-94.

Following inferences can be drawn from the Table 5.37 on the status of children's enrolment rates across the regions of Gujarat.

1. In terms of never enrolled children of 6-14 years of age, 21.39% of the total children in Dry region of Gujarat has never been enrolled so far during 1999-00, followed by 18.17% in Eastern regions during the same period. Both these regions are largely either covered under DDP or DPAP programmes in the state. Other regions of the state have shown less percentage of all children, male and female which are never enrolled. Most striking observation is that amongst female (aged 6-14) which were never enrolled reported highest percentage of 32.11% from Dry region, followed by female of Eastern region with 20.76%. Other regions reported comparatively lower percentage of female child which were never enrolled.
2. In case of male of the same age groups Eastern regions lags far behind of the other regions with about 16% reported being never enrolled, followed by Dry region with 13% of total male children which were never enrolled.

3. In other words access to almost 1/3rd of female (age 6-14) and 1/4th of all the children (age 6-14) has been never been enrolled to any school during 1999-00 due to various economic and social constraints in the Dry region of Gujarat.
4. However those enrolled but left are comparatively less across Male, Female and All Persons in Gujarat's Dry Regions than those of other regions.
5. In terms of children (6-14 age) going to school lowest percentage of about 73% for all persons has been reported from Dry regions of Gujarat, worst is the situation of female (6-14) which reported only 60% of them going to school, however, their brothers are in a slightly better position with 83% reported going to school. Lowest percentage of male (77.33%) has been reported going to school from the Eastern regions. These two regions namely Dry regions and Eastern Regions are major problems areas in terms of access to educations and its continuity. This could be attributed to the fact that often children in these regions provides support to family by working either in their own farm or are engaged in other economic activities.
6. There has been less improvement in access to schooling (percentage of children aged 6-14 going to school) in dry regions compared to other regions during 1993-94 and 1999-00. Most disturbing fact is that, percentage of female (6-14 age groups) has shown marginal decline in going to school during the same period
7. In case of net enrolment, Dry region of Gujarat is worst hit areas. It has reported lowest percentage of children including male and female for net enrolment as compared to other regions of the state. It is important to understand the bottleneck in the way of getting access to education in this region. On the other hand improvement in net enrolments has also not been encouraging. Dry regions registered lowest improvement in net enrolment amongst all the regions across all the groups of children (6-14) during 1993-94 and 1999-00.
8. Thus is evident from the above analysis that Dry region of Gujarat is lagging behind in one of the major indicators of human development i.e. level of literacy and access to education. This region is lacking in many other areas which has been discussed earlier. The impact of drought on education of children at household level has been assessed through primary survey in the present study.

Impact of Droughts on Children's Education

Table 5.36 shows the impact of drought on the schooling of children in drought prone areas in Gujarat. The data on the impact of drought on education of children has been used from our field survey conducted during April / May 2006. A complete house listing of 2758 household were done across 12 villages in 6 district of Gujarat. 3 each district of DDP and DPAP were selected for the survey. A total of 2758 household surveyed, at initial stage to determine the sample household for the convenient of better results, the data presented in this analysis are complete house listing data (total count of household in each village). There were 2977 boys and 2562 girls which here below 14 years of age in all the 2758 household. The impact of drought on regularity of schooling of those children that are enrolled has been estimated. Out of the total boys (2977) and girls (2562), 622 boys (21%) and 346 girls (13%) are not going to school as they are either not

of school going age groups or have never been enrolled. However, a significant number of boys (19.61%) found attending school irregular, while only 2 % of girls found irregular in attending their school. As compared to girls boys are comparatively more regular in schools. This indicates clear gender discrimination in school education in drought and desert areas of Gujarat.

Conclusions

Regular drought in desert and drought prone areas of Gujarat has lead to the general backwardness of its people. Both short term and long term impacts have been observed in these areas in term of reduced household income, vulnerability and poverty. The human development status of the people in these areas has also been found disturbing compared to the rest of the regions in the state. People in drought prone areas are poor and face various kinds of vulnerability-physical and socio-economic during drought periods. High incidence of poverty and poor human development reveals the general backwardness of the people living in drought prone areas in Gujarat. Agriculture development is very poor and has resulted in heavy loss of agriculture income due to frequent droughts and crop failure. This leads to severe indebtedness of the people in drought regions of the state. The extent of indebtedness has been found very high in this region. Thus, the drought prone areas in Gujarat have shown general backwardness of the people in terms of poverty, vulnerability and low human development. These regions are lagging behind compared to other regions in terms of mainstream economic development.

Annexure: V

Table 5.1 District-wise percentage of BPL Families in Gujarat -2000

Sl.No.	Name of Districts	% BPL families	Drought Area
1	Mehshana	19.57	NonDDP+DPAP
2	Gandhinagar	22.02	NonDDP+DPAP
3	Junagadh	25.12	DPAP
4	Ahmedabad	26.46	DPAP
5	Amreli	27.04	DPAP
6	Anand	29.48	NonDDP+DPAP
7	Porbandar	29.63	DPAP
8	Bhavnagar	29.70	DPAP
9	Rajkot	30.17	DDP
10	Kutch	33.05	DDP
11	Banaskantha	33.98	DDP
12	Patan	34.38	DDP
13	Kheda	36.43	NonDDP+DPAP
14	Surendranagar	36.93	DDP
15	Vadodara	38.06	DPAP
16	Sabarkantha	43.73	DPAP
17	Jamnagar	44.92	DDP
18	Surat	48.21	NonDDP+DPAP
19	Navsari	50.65	DPAP
20	Bharuch	51.18	DPAP
21	Valsad	53.66	DPAP
22	Panchmahal	69.92	DPAP
23	Dahod	80.80	DPAP
24	Narmada	82.66	DPAP
25	The Dang	86.89	DPAP

Source: Govt. of Gujarat (BPL Census)

Table 5.2 Percentage of BPL families under DDP/DPAP & Other in Gujarat

District under	% OF FAMILIES	BPL
DDP	56.13	
DPAP	67.24	
OTHERS	45.56	
STATE	54.51	

Source: Govt. of Gujarat (BPL Census)

Table 5.3 NSS region-wise incidence of poverty in Gujarat

NSS Region	Incidence of poverty (%)*	
	1987-88	1993-94
Total		
1 Gujarat Eastern	34.49	25.06
2 Northern Plains	29.03	24.58
3 Southern Plains	25.85	22.45
4 Gujarat Dry Regions	40.20	23.30
5 Saurashtra	28.18	18.80
Rural		
1 Gujarat Eastern	34.19	24.12
2 Northern Plains	25.87	20.52
3 Southern Plains	22.85	23.51
4 Gujarat Dry Regions	46.95	22.52
5 Saurashtra	18.95	10.03
Urban		
1 Gujarat Eastern	39.32	34.33
2 Northern Plains	34.23	30.05
3 Southern Plains	30.89	20.89
4 Gujarat Dry Regions	53.88	27.03
5 Saurashtra	53.77	34.04

* EOPL estimate taken, which are based on the Expert Group's methodology.

Source: Dubey and Gangopadhyay (1997).

Table : 5.4 HH Characteristic, Employment, poverty and caste

Main Occu.	SC		ST		OBC		Other		Total	
	BPL	Total	BPL	Total	BPL	Total	BPL	Total	BPL	Total
Agricultural	13	39	7	16	23	70	16	51	59	176
Agri_Labour	15	34	16	30	34	76	18	34	83	174
Other Labour	4	9	2	4	4	13	4	5	14	31
Village labour	3	7	3	6	4	9	2	3	12	25
Home Made	0	0	2	2	3	3	1	1	6	6
Factory worker	2	2	0	0	0	1	0	1	2	4
Trade	2	4	1	2	0	5	3	10	6	21
Government service	0	4	0	2	2	8	1	10	3	24
Private service	3	6	1	3	0	9	2	5	6	23
Animals husbandry	0	0	0	0	5	11	0	2	5	13
Fishery	0	0	1	1	1	3	0	0	2	4
Others	0	3	2	3	9	21	0	1	11	28
Total	42	108	35	69	85	229	48	124	210	530
Cast wise %	38.9		50.7		37.1		38.7		39.6	

Source: Field Survey, April/May 2006

Table : 5.5 Benefits to BPL Families by Occupation and poverty

Main Occu.	BPL			Total	Type of benefits				
	NR	Yes	No		HH Benefits	House plot	House (Indira Avas)	Loan for self Employment	Others
Agricultural	3	59	114	176	8	0	5	0	4
Agri_Labour	3	83	88	174	23	9	19	0	9
Other Labour	3	14	14	31	6	3	4	0	1
Village labour	0	12	13	25	5	1	4	1	1
Home Made	0	6	0	6	1	0	1	0	0
Factory worker	0	2	2	4	0	0	0	0	0
Trade	1	6	14	21	3	1	2	0	1
Government service	0	3	21	24	0	0	0	0	0
Private service	3	6	14	23	1	0	1	0	0
Animals husbandry	0	6	8	14	2	1	0	0	1
Fishery	0	1	2	3	1	1	1	0	0
Others	1	12	16	29	6	6	6	0	1
Total	14	210	306	530	56	22	43	1	18

Source: Field Survey, April/May 2006

Table: 5.6 Landholding wise Mortgage, sale, lease out and lease in

Category of Land	No. of HH	Mortgage		Sale		Lease out		Lease in	
		Yes	No	Yes	No	Yes	No	Yes	No
0. To 2.5	60	9	51	4	60	4	56	0	60
2.6 to 5.0	81	6	75	9	79	3	78	3	78
5.1 to 10	78	6	72	8	75	3	75	2	76
10 + above	51	7	44	4	50	4	47	2	49
Land less	260	0	0	0	0	0	0	0	0
Total	530	28	242	25	264	14	256	7	263

Source: Field Survey, April/May 2006

Table: 5.7 Reason of sale of Assets by farmer

Category of Land	No Sale Shifting For	For Home Expense	For Social Event	For Debit payment	Grand Total
0. To 2.5	56	4	0	0	60
2.6 to 5.0	72	7	0	1	81
5.1 to 10	70	6	0	1	78
10 + above	47	3	1	0	51
Land less	260	0	0	0	260
Total	505	20	1	2	528

Source: Field Survey, April/May 2006

Table : 5.8 Land wise livestock (No. of HH) and Average Land holding of farmer

Category of Land	Yes	No	Avg. Landing size (in acre)	Total
0. To 2.5	35	25	1.25	60
2.6 to 5.0	45	36	3.54	81
5.1 to 10	38	40	7.11	78
10 + above	21	30	18.95	51
Land less	139	121	0.00	260
Total	278	252	3.55	530

Source: Field Survey, April/May 2006

Table 5.9 House hold facilities

Main Occu.	No.of HH facility					No.of Total HH
	House	Electricity	Water	Bathroom	Toilet	
			tap			
Agricultural	176	142	51	33	29	176
Agri_Labour	165	104	45	16	11	174
Other Labour	30	20	7	4	5	31
Village labour	25	19	9	6	3	25
Home Made	6	5	2	0	1	6
Factory worker	4	3	3	1	1	4
Trade	21	18	6	11	10	21
Government service	24	21	12	14	16	24
Private service	21	21	11	9	9	23
Animals husbandry	12	10	3	1	0	14
Fishery	3	3	1	0	0	3
Others	26	19	15	11	10	29
Total	513	385	165	106	95	530

Source: Field Survey, April/May 2006

Table 5.10 Occupational Vulnerability Change in Occupational structure

Main Occu.	Current	Occupational structure	
		Five year ago	Ten year ago
Agricultural	176	210	213
Agri_Labour	174	193	195
Other Labour	31	17	18
Village labour	25	12	13
Home Made	6	0	0
Factory worker	4	6	5
Trade	21	18	17
Government service	24	29	28
Private service	23	18	16
Animals husbandry	14	8	7
Fishery	3	1	1
Others	29	18	17
Total	530	530	530

Source: Field Survey, April/May 2006

Table 5.11 Hose hold debt for Social event by Occupation group

Main Occu.	No.of Total HH	Curr ent	Average debt	Five year ago	Average debt	Ten year ago	Average debt
Agricultural	176	46	44311	8	77000	5	38000
Agri_Labour	174	46	38863	8	21375	5	6000
Other Labour	31	5	44000	2	5000	1	0
Village labour	25	5	24000	2	17500	1	10000
Home Made	6	1	50000	1	50000	1	50000
Factory worker	4	2	22500	0	0	0	0
Trade	21	5	58000	2	5000	1	0
Government service	24	2	65000	1	100000	0	0
Private service	23	4	17750	0	0	0	0
Animals husbandry	14	5	56000	2	35000	0	0
Fishery	3	1	4000	0	0	0	0
Others	29	7	52286	2	75000	2	85000
Total	530	129	41876	28	43285.71	16	28125

Source: Field Survey, April/May 2006

Table 5.12 Source of social debt in HH

Main Occu.	Relative Govern ment bank		Cooper ative bank	Villagers/ Money lender	Other	HH Total	Average of yearly interest
Agricultural	15	1	3	27	1	177	20.91
Agri_Labour	8			37	1	174	20.13
Other Labour			1	4		31	24.20
Village labour	3		1	1		25	22.80
Home Made				1		6	0.00
Factory worker					1	4	7.00
Trade	2			3		21	10.00
Government service	1	1				24	24.50
Private service	2			2		23	5.00
Animals husbandry	2	1		3		14	20.60
Fishery				1		3	0.00
Others	2		1	4		28	13.86
Total	35	3	6	83	3	530	19.04

Source: Field Survey, April/May 2006

Table 5.13 No. Of HH debt for social event

Main Occu.	No.of HH. Social event / build	House repairing	Illness/hospital	Purchase of vehicle
Agricultural	34	11	1	1
Agri_Labour	28	15	2	0
Other Labour	3	0	1	1
Village labour	4	0	1	0
Home Made	1	0	0	0
Factory worker	1	1	0	0
Trade	5	0	0	0
Government service	2	0	0	0
Private service	1	2	0	0
Animals husbandry	5	1	0	0
Fishery		1	0	0
Others	4	2	1	0
Total	88	33	6	2

Source: Field Survey, April/May 2006

Table 5.14 HH reporting debt for agriculture production

Main Occu.	No.of HH	Debt for product	Average Debt Rs.	Reason of debt					
				Rate of interest	Purchase of cattle	Live stock	Agricultural equipment (tempo, business)	Others	Agriculture input
Agricultural	176	64	38960.94	12.84	1	1	4	0	58
Agri_Labour	174	7	30928.57	13.43	2	0	0	0	5
Other Labour	31	4	34500.00	9.00	0	0	0	0	4
Village labour	25	2	8500.00	11.50	0	0	0	0	2
Home Made	6	0	0.00	0.00	0	0	0	0	0
Factory worker	4	0	0.00	0.00	0	0	0	0	0
Trade	21	2	40000.00	21.00	0	0	0	1	1
Government service	24	6	75000.00	11.17	0	0	2	0	4
Private service	23	2	27500.00	12.00	0	0	0	0	2
Animals husbandry	14	5	28200.00	14.40	2	0	0	0	3
Fishery	3	0	0.00	0.00	0	0	0	0	0
Others	29	7	165000.0	14.71	0	0	1	0	6
Total	530	99	47939.39	12.96	5	1	7	1	85

Source: Field Survey, April/May 2006

Table 5.15 Source of debt (Agricultural Production Purposes)

Main Occu.	Government Cooperative Co. Op. Villagers/Money			
	bank	bank	Bank	lender
Agricultural	4	52	1	7
Agri_Labour	0	4	0	3
Other Labour	0	3	0	1
Village labour	0	2	0	0
Home Made	0	0	0	0
Factory worker	0	0	0	0
Trade	0	1	0	1
Government service	2	4	0	0
Private service	0	2	0	0
Animals husbandry	1	2	0	2
Fishery	0	0	0	0
Others	0	6	0	1
Total	7	76	1	15

Source: Field Survey, April/May 2006

TABLE 5.16 HH Saving In The Study Area

Main Occu.	Saving		Source of Saving			
	Yes	No	Co.Bank	Other bank	Post Office	Ornaments
Agricultural	43	134	6	6	0	42
Agri_Labour	15	159	0	3	1	15
Other Labour	4	27	0	1	0	3
Village labour	3	22	0	1	0	3
Home Made	1	5	0	0	0	1
Factory worker	1	3	0	1	0	2
Trade	3	18	0	1	0	3
Government service	9	15	2	4	0	8
Private service	5	18	1	2	0	5
Animals husbandry	4	10	1	1	0	5
Fishery	0	3	0	0	0	0
Others	6	22	2	1	1	1
Total	94	436	12	21	2	88

Note: Total HH could not match as HH reported multiple sources of savings.

Source: Field Survey, April/May 2006

Table 5.17 Actual savings of HH in the study area.

Main Occu.	Co-oprative bank			Other Bank			Ornaments		
	Currant saving	Five year ago	Ten year ago	Currant saving	Five year ago	Ten year ago	Currant saving	Five year ago	Ten year ago
Agricultural	180000	130000	40000	184000	140000	40000	563000	279000	181000
Agri_Labour	0	0	0	44000	50000	10000	141000	42000	42000
Other Labour	0	0	0	11000	0	0	28000	18000	18000
Village labour	0	0	0	18000	40000	0	33000	13000	6000
Home Made	0	0	0	0	0	0	10000	10000	10000
Factory worker	0	0	0	40000	21000	0	14000	14000	14000
Trade	0	0	0	200000	100000	100000	35000	35000	25000
Government service	700000	500000	250000	115000	60000	40000	127000	97000	82000
Private service	31500	16000	6000	320000	120000	20000	190000	235000	58000
Animals husbandry	0	0	0	10000	0	0	43000	23000	15000
Fishery	0	0	0	0	0	0	0	0	0
Others	65000	20000	10000	30000	60000	60000	7000	7000	7000
Total	976500	666000	306000	972000	591000	270000	1191000	773000	458000
Average per HH	1842	1256	577	1833	1115	509	13534	14865	10177

Source: Field Survey, April/May 2006

Table 5.17a Estimated Avg. Value of HH saving in ten of Ornaments by Occupational groups during last decade.

Main Occu.	Current year		Five year ago		Ten year ago	
	No. of HH	Value of Ornaments	No. of HH	Value of Ornaments	No. of HH	Value of Ornaments
Agricultural	42	13404.76	23	12130.43	19	9526.3
Agri_Labour	15	9400	6	7000	6	7000.0
Other Labour	3	9333.333	2	9000	2	9000.0
Village labour	3	11000	3	4333.333	2	3000.0
Home Made	1	10000	1	10000	1	10000.0
Factory worker	2	7000	2	7000	2	7000.0
Trade	3	11666.67	2	17500	2	12500.0
Government service	8	15875	6	16166.67	6	13666.7
Private service	5	38000	3	78333.33	3	19333.3
Animals husbandry	5	8600	3	7666.667	1	15000.0
Fishery	0	0	0	0	0	0.0
Others	1	7000	1	7000	1	7000.0
Total	88	13534.09	52	14865.38	45	10177.8

Source: Field Survey, April/May 2006

Table. 5.18 Percentage household reported seasonal out-migrating by their occupation in selected villages in the Study Area

Occupation Groups	Surendranagar		Junagadh		Kutch		Banaskantha		Pachmahal		Bharuch	
	Gangad	Kalam	Malondha	Badalpur	Moti Sindhodi	Shuthari	Joravardh	Limbal	Kansaravav	Kherap	Ankhi	Dehari
Agricultural	20.88	11.98	9.38	3.32	6.25	0.80	3.52	5.37	0.93	2.44	0.58	0.66
Agri_Labour	35.16	24.55	12.50	5.21	5.00	1.86	4.30	3.72	13.08	12.20	1.55	9.21
Other Labour	8.79	4.79	1.34	4.27	0.00	1.06	0.00	0.41	0.93	7.32	0.78	0.66
Village labour	0.00	0.60	0.00	2.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Home Made	0.55	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Factory worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.93	0.61	0.00	0.00
Trade	0.55	0.60	0.45	0.47	0.00	0.00	0.00	0.00	0.00	0.61	0.00	0.66
Government service	0.00	0.00	0.00	0.47	0.63	0.27	0.39	0.83	0.93	0.00	0.00	0.00
Private service	0.55	2.99	0.89	0.00	0.00	1.06	0.00	0.00	0.00	0.61	0.19	0.66
Animals husbandry	4.40	0.00	0.00	0.95	0.00	0.53	0.00	0.00	0.00	0.00	0.00	0.00
Fishery	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Others	0.00	0.60	0.00	0.00	0.00	0.27	0.78	0.00	0.00	0.00	0.00	0.00
Total	70.88	47.90	24.55	17.06	11.88	5.84	8.98	10.33	16.82	23.78	3.10	11.84

Source: Field Survey, April/May 2006

Table 5.19 Out migration of HH by Occupational groups.

Occupation Groups	Seasonal Migration		Grand Total
	Yes	No	
Agricultural	12.80	87.20	100.00
Agri_Labour	23.48	76.52	100.00
Other Labour	27.83	72.17	100.00
Village labour	30.00	70.00	100.00
Home Made	50.00	50.00	100.00
Factory worker	5.71	94.29	100.00
Trade	11.32	88.68	100.00
Government service	5.88	94.12	100.00
Private service	12.30	87.70	100.00
Animals husbandry	22.64	77.36	100.00
Fishery	0.00	100.00	100.00
Others	4.08	95.92	100.00
Total	17.40	82.60	100.00

Source: Field Survey, April/May 2006

Table 5.20 Area of migration in selected districts.

District	Name of Taluka	Name of Village	DDP/ DPAP not-villages	Reported % migrating	Within % the district	Outside the district	Outside the state	NR	Total
Surendranagar	Lakhtar	Gangad	DDP	53 29.12	9 4.95	118 64.84	0 0.00	2 1.10	182
		Kalam	DDP	87 52.10	4 2.40	72 43.11	1 0.60	3 1.80	167
Kachchh	Abadasa	Moti Sindhodi	DDP	141 88.13	16 10.00	3 1.88	0 0.00	0 0.00	160
		Shuthari	DDP	355 94.16	11 2.92	8 2.12	3 0.80	0 0.00	377
Banaskantha	Vav	Joravargadh	DDP	233 91.02	9 3.52	13 5.08	1 0.39	0 0.00	256
		Limbala	DDP	217 89.67	2 0.83	22 9.09	1 0.41	0 0.00	242
Junagadh	Veraval	Malondha	DPAP	169 75.45	51 22.77	4 1.79	0 0.00	0 0.00	224
		Badalpur	DPAP	175 82.94	21 9.95	10 4.74	1 0.47	4 1.90	211
Halol	Panchmahal	Kansaravav	DPAP	89 83.18	1 0.93	17 15.89	0 0.00	0 0.00	107
		Kherap	DPAP	125 76.22	5 3.05	33 20.12	1 0.61	0 0.00	164
Bharuch	Jambusar	Ankhi	DPAP	500 96.90	7 1.36	7 1.36	1 0.19	1 0.19	516
		Dehari	DPAP	134 88.16	12 7.89	6 3.95	0 0.00	0 0.00	152
Grand Total				2278 82.60	148 5.37	313 11.35	9 0.33	10 0.36	2758

Source: Field Survey, April/May 2006

Table 5.21 Seasonal migration of HH to places of Region.

District Name	Name of Taluka	Name of Village	DDP/ DPAP not-villages migrating	Reported	%	Rural	%	Urban	%	NR	%	Total
Surendranagar	Lakhtar	Gangad	DDP	53	29.12	47	25.82	80	43.96	2	1.10	182
		Kalam	DDP	87	52.10	28	16.77	49	29.34	3	1.80	167
Kachchh	Abadasa	Moti Sindhodi	DDP	141	88.13	19	11.88		0.00	0	0.00	160
		Shuthari	DDP	355	94.16	17	4.51	5	1.33	0	0.00	377
Banaskantha	Vav	Joravargadh	DDP	233	91.02	16	6.25	7	2.73	0	0.00	256
		Limbala	DDP	217	89.67	21	8.68	4	1.65	0	0.00	242
Junagadh	Veraval	Malondha	DPAP	169	75.45	43	19.20	12	5.36	0	0.00	224
		Badalpur	DPAP	175	82.94	30	14.22	2	0.95	4	1.90	211
Halol	Panchmahal	Kansaravav	DPAP	89	83.18	11	10.28	7	6.54	0	0.00	107
		Kherap	DPAP	125	76.22	33	20.12	6	3.66	0	0.00	164
Bharuch	Jambusar	Ankhi	DPAP	500	96.90	9	1.74	6	1.16	1	0.19	516
		Dehari	DPAP	134	88.16	5	3.29	13	8.55	0	0.00	152

Source: Field Survey, April/May 2006

Table. 5.22 Nature of migration of the household by village in the study area

District Name	Name of Taluka	Name of Village	DDP/ Repor ted village not-migra ting	%	Wit h fam ily	%	Only men	%	Only adults Man / women	%	Onl y Wo me n	%	Total	
Surendranagar	Lakhtar	Gangad	DDP	53	29.12	92	50.55	3	1.65	34	18.68	0	0.00	182
		Kalam	DDP	87	52.10	50	29.94	14	8.38	16	9.58	0	0.00	167
Kachchh	Abadasa	Moti Sindhodi	DDP	141	88.13	10	6.25	7	4.38	2	1.25	0	0.00	160
		Shuthari	DDP	355	94.16	2	0.53	19	5.04	0	0.00	1	0.27	377
Banaskantha	Vav	Joravargadh	DDP	233	91.02	18	7.03	5	1.95	0	0.00	0	0.00	256
		Limbala	DDP	217	89.67	15	6.20	5	2.07	4	1.65	1	0.41	242
Junagadh	Veraval	Malondha	DPAP	169	75.45	1	0.45	48	21.43	4	1.79	2	0.89	224
		Badalpur	DPAP	175	82.94	1	0.47	22	10.43	8	3.79	5	2.37	211
Halol	Panchmahal	Kansaravav	DPAP	89	83.18	13	12.15	2	1.87	3	2.80	0	0.00	107
		Kherap	DPAP	125	76.22	25	15.24	9	5.49	4	2.44	1	0.61	164
Bharuch	Jambusar	Ankhi	DPAP	500	96.90	7	1.36	8	1.55	1	0.19	0	0.00	516
		Dehari	DPAP	134	88.16	6	3.95	3	1.97	3	1.97	6	3.95	152
Grand Total				2278	82.60	240	8.70	145	5.26	79	2.86	16	0.58	2758

Source: Field Survey, April/May 2006

Table.5.23 Duration of out-migration by the size of the landholding in the study area

District Name	Name of Taluka	Name of Village	DDP/ DPAP villages	Report ed non-migration	Duration in months in a normal year										Total HH	
					%	< 3 %	4 to 6 %	7 to 9 %	9 to 12 %	NR %						
Surendranagar	Lakhtar	Gangad	DDP	53	29.12	20	10.99	55	30.22	40	21.98	14	7.69	0	0.00	182
		Kalam	DDP	87	52.10	36	21.56	15	8.98	3	1.80	18	10.78	8	4.79	167
Kachchh	Abadasa	Moti Sindhodi	DDP	141	88.13	1	0.63	4	2.50	14	8.75	0	0.00	0	0.00	160
		Shuthari	DDP	355	94.16	5	1.33	11	2.92	1	0.27	4	1.06	1	0.27	377
Banaskantha	Vav	Joravargadh	DDP	233	91.02	8	3.13	5	1.95	1	0.39	8	3.13	1	0.39	256
		Limbala	DDP	217	89.67	4	1.65	12	4.96	3	1.24	6	2.48	0	0.00	242
Junagadh	Veraval	Malondha	DPAP	169	75.45	22	9.82	19	8.48	5	2.23	4	1.79	5	2.23	224
		Badalpur	DPAP	175	82.94	18	8.53	7	3.32	3	1.42	2	0.95	6	2.84	211
Halol	Panchmahal	Kansaravav	DPAP	89	83.18	0	0.00	13	12.15	0	0.00	3	2.80	2	1.87	107
		Kherap	DPAP	125	76.22	7	4.27	17	10.37	4	2.44	8	4.88	3	1.83	164
Bharuch	Jambusar	Ankhi	DPAP	500	96.90	8	1.55	2	0.39	1	0.19	4	0.78	1	0.19	516
		Dehari	DPAP	134	88.16	14	9.21	2	1.32	0	0.00	2	1.32	0	0.00	152
Grand Total				2278	82.60	143	5.18	162	5.87	75	2.72	73	2.65	27	0.98	2758

Source: Field Survey, April/May 2006

Table. 5.24 Nature of migration of the household by occupation in the study area

Occupation Groups	Not Reported With migrating	With family	Only men	Only adults Man / women	Only Women	Total
Agricultural	886	57	45	25	3	1016
Agri_Labour	766	132	56	38	9	1001
Other Labour	153	22	22	12	3	212
Village labour	14	1	4	1	0	20
Home Made	4	4	0	0	0	8
Factory worker	33	1	1	0	0	35
Trade	47	2	2	2	0	53
Government service	112	2	4	1	0	119
Private service	107	6	8	0	1	122
Animals husbandry	41	8	2	0	2	53
Fishery	21	0	0	0	0	21
Others	94	3	1	0	0	98
Total	2278	238	145	79	18	2758

Source: Field Survey, April/May 2006

Table. 5.25 Coverage Area (Distance) of Migration by Occupational Groups

Occupation Groups	Not Reported migrating	Within the district	Outside the district	Outside the state	NR	Total
Agricultural	886	46	80	2	2	1016
Agri_Labour	766	69	163	1	2	1001
Other Labour	153	14	42		3	212
Village labour	14	1	4	1		20
Home Made	4		4			8
Factory worker	33	2				35
Trade	47	4	1		1	53
Government service	112	4	1	2		119
Private service	107	5	6	2	2	122
Animals husbandry	41	2	10			53
Fishery	21					21
Others	94	1	2	1		98
Total	2278	148	313	9	10	2758

Source: Field Survey, April/May 2006

Table .5.26 Regional destination (RIO), of HH by Occupational Groups

Occupation Groups	Not Reported migrating	Rural	Urban	NR	Total
Agricultural	886	62	66	2	1016
Agri. Labour	766	166	67	2	1001
Other Labour	153	32	24	3	212
Village labour	14	4	2	0	20
Home Made	4	1	3	0	8
Factory worker	33	0	2	0	35
Trade	47	4	1	1	53
Government service	112	3	4	0	119
Private service	107	3	10	2	122
Animals husbandry	41	4	8	0	53
Fishery	21	0		0	21
Others	94	0	4	0	98
Total	2278	279	191	10	2758

Source: Field Survey, April/May 2006

NR= No Response

Table. 5.27 Duration of out-migration by occupation in the study area

Occupation Groups	Reported non- migration	Duration in months in a normal year					NR	Total HH
		< 3	4 to 6	7 to 9	9 to 12			
Agricultural	886	34	35	36	20	5	986	
Agri_Labour	766	79	90	29	24	13	972	
Other Labour	153	17	27	4	8	3	226	
Village labour	14	3	3	0	0		28	
Home Made	4	0	0	0	3	1	106	
Factory worker	33	0	0	0	1	1	35	
Trade	47	3	2	0	1		50	
Government service	112	2	1	1	3		101	
Private service	107	1	2	1	7	4	122	
Animals husbandry	41	4	2	4	2		43	
Fishery	21	0	0	0	0		21	
Others	94	0	0	0	4		68	
Total	2278	143	162	75	73	27	2758	

Source: Field Survey, April/May 2006

NR= No Response

Table.5.28 Nature of migration of the household by size of holdings in the study area

Land holding size	Not Reported migrating	With family	Only men	Only adults Man / women	Only Women	Total	Reported % of Migrated HH	
0. To 2.5	326	27	34	16	4	407	77	16.04
2.6 to 5.0	260	18	13	8		299	39	8.1
5.1 to 10	267	30	16	15	1	329	62	12.9
10 + above	219	30	10	6		265	46	9.5
No Land	1206	133	72	34	13	1458	252	52.5
Total	2278	238	145	79	18	2758	480	100

Source: Field Survey, April/May 2006

Table 5.29 Area Coverage of HH (distance) migration by the farmers.

Land holding size	Not Reported migrating	Within the district	Outside the district	Outside the state	NR	Total
0. To 2.5	326	33	46	1	1	407
2.6 to 5.0	260	15	23	1		299
5.1 to 10	267	17	44	1		329
10 + above	219	5	35	2	4	265
No Land	1206	78	165	4	5	1458
Total	2278	148	313	9	10	2758

Source: Field Survey, April/May 2006

NR= No Response

TABLE 5.30 REGIONAL DESTINATION (RURAL / URBAN) OF MIGRATION BY FARMERS.

Land holding size	Not Reported migrating	Rural	Urban	NR	Total
0. To 2.5	326	62	18	1	407
2.6 to 5.0	260	29	10		299
5.1 to 10	267	25	37		329
10 + above	219	11	31	4	265
No Land	1206	152	95	5	1458
Total	2278	279	191	10	2758

Source : Primary Survey - April 2006,

NR= No Response

Table.5.31 Duration of out-migration by the size of the landholding in the study area

Land holding size	Not Reported migration	Migrated	%	Duration in months in a normal year										Total HH
				< 3	4 to 6	7 to 9	9 to 12	NR						
0. To 2.5	326	81	19.90	20	4.91	35	8.60	8	1.97	10	2.46	8	1.97	407
2.6 to 5.0	260	39	13.04	6	2.01	18	6.02	6	2.01	8	2.68	1	0.33	299
5.1 to 10	267	62	18.84	16	4.86	15	4.56	20	6.08	10	3.04	1	0.30	329
10 + above	219	46	17.36	11	4.15	6	2.26	16	6.04	12	4.53	1	0.38	265
No Land	1206	252	17.28	90	6.17	88	6.04	25	1.71	33	2.26	16	1.10	1458
Total	2278	480	17.40	143	5.18	162	5.87	75	2.72	73	2.65	27	0.98	2758

Source: Field Survey, April/May 2006

NR= No response

Table.5.32 Nature of migration of the household by caste groups in the study area

Caste Groups	Reported not-migrating	With family	Only men	Only adults Man / women	Only Women	Total	Reported migrating	% of H.H.
SC	216	49	23	32	1	321	105	22.9
ST	191	28	7	8	6	240	49	10.4
OBC	1534	145	102	29	9	1819	285	60.0
Other	342	13	13	10		378	36	7.5
Total	2283	235	145	79	16	2758	475	4.8
%		(49.0)	(30.0)	(16.4)	(3.3)			

Source: Field Survey, April/May 2006

Table. 5.33 Nature of migration of the household by caste groups in the study area

Caste Groups	Reported not-migrating	Migrated	%	With family	%	Only men	%	Only adults Man / women	%	Only Women	%	Total
SC	216	106	33.02	49	15.26	23	7.17	32	9.97	1	0.31	321
ST	191	50	20.83	28	11.67	7	2.92	8	3.33	6	2.50	240
OBC	1534	288	15.82	145	7.97	102	5.61	29	1.59	9	0.49	1819
Other	342	36	9.55	13	3.44	13	3.44	10	2.65		0.00	378
Total	2283	480	17.40	235	8.52	145	5.26	79	2.86	16	0.58	2758

Source: Field Survey, April/May 2006

Table .5.34 Nature of migration of the household by caste groups in the study area

Caste Groups	Reported not-migrating	Migrated	%	With family	%	Only men	%	Only adults Man / women	%	Only Women	%	Total
SC	216	106	33.02	49	15.26	23	7.17	32	9.97	1	0.31	321
ST	191	50	20.83	28	11.67	7	2.92	8	3.33	6	2.50	240
OBC	1534	288	15.82	145	7.97	102	5.61	29	1.59	9	0.49	1819
Other	342	36	9.55	13	3.44	13	3.44	10	2.65		0.00	378
Total	2283	480	17.40	235	8.52	145	5.26	79	2.86	16	0.58	2758

Source: Field Survey, April/May 2006

TABLE.5.35 IMPACT OF DROUGHT ON SCHOOLING OF CHILDREN IN THE STUDY AREA

Drought effect	No.HH	<14 Child		Regular		Irregular		Not Going		Total Children	
		Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Yes	1445	1643	1508	1193	846	295	41	388	197	1876	1084
No	1313	1334	1054	987	641	289	10	234	149	1510	800
Total	2758	2977	2562	2180	1487	584	51	622	346	3386	1884

Source: Field Survey, April/May 2006

Table 5.36 NSS region-wise literacy rates, 1993-94 and 1999-00 (in percentage)

NSS Region	1999-00			1993-94		
	Male	Female	Persons	Male	Female	Persons
Eastern region	67.38	45.60	56.50	66.82	39.00	53.49
Plains–	85.17	62.82	74.21	83.89	58.97	71.90
Northern region						
Plains–	88.74	70.96	80.24			
Southern region				77.57	57.14	68.17
Dry regions	69.89	41.30	56.11	75.71	42.81	59.93
Saurashtra	79.50	59.60	69.57	73.33	50.55	61.90
Gujarat	80.19	57.96	69.34	76.75	51.57	64.61

Source: Calculated from NSS data

Table 5.37 Enrolment rates (age 6-14 years) by NSS regions, Gujarat, 1999-00 and 1993-94

NSS region	Per cent 1999-00				Per cent 1993-94	
	Never Enrolled	Enrolled but left	In age 6-14 going to school	Net enrolment in elementary school	In age 6-14 going to school	Net enrolment in elementary school
	Male				Male	
Eastern region	15.78	6.89	77.33	75.87	76.21	70.46
Plains – Northern region	9.33	4.27	86.40	82.20	87.44	81.44
Plains – Southern region	6.32	7.89	85.79	81.48	84.37	76.86
Dry region	12.99	3.78	83.24	64.37	80.12	63.04
Saurashtra	5.45	4.12	90.44	75.72	81.38	79.55
Rural	10.32	6.00	83.68	75.45	79.91	73.52
Urban	7.26	3.53	89.21	80.47	88.88	80.87
Gujarat	9.38	5.25	85.37	76.98	82.57	75.70
	Female				Female	
Eastern region	20.76	7.74	71.49	68.20	66.91	60.10
Plains – Northern region	16.24	7.93	75.83	71.73	73.77	68.23
Plains – Southern region	10.50	7.60	81.90	76.03	72.73	63.56
Dry region	32.11	7.45	60.45	48.66	61.26	45.01
Saurashtra	10.97	9.89	79.14	66.69	69.18	68.23
Rural	19.88	8.76	71.36	63.95	63.49	57.35
Urban	8.64	7.02	84.34	77.48	82.90	74.89
Gujarat	16.68	8.26	75.05	67.80	69.55	62.82
	Persons				Persons	
Eastern region	18.17	7.30	74.53	72.19	71.98	65.75
Plains – Northern region	12.72	6.06	81.23	77.07	80.78	75.01
Plains – Southern region	8.21	7.76	84.03	79.01	79.24	71.00
Dry region	21.39	5.39	73.22	57.46	70.99	54.31
Saurashtra	8.04	6.84	85.12	71.47	75.32	73.92
Rural	14.89	7.32	77.80	69.95	72.17	65.90
Urban	7.89	5.11	87.00	79.12	85.95	77.95
Gujarat	12.82	6.67	80.52	72.66	76.37	69.56

Source: Calculated using NSS data.

Chapter Six

**Adequacy of drought mitigation
measures**

Chapter Six

ADEQUACY OF DROUGHT MITIGATION MEASURES

Introduction

Drought relief measures are carried out on a usual basis in Gujarat as large part of the state are under the influence of drought. Apart from area development programme i.e. DPAP and DDP programmes, which are centrally sponsored programme, state governments takes care of drought relief work during the drought period in some or the other areas in Gujarat. Government of Gujarat under relief commissioners, follows “the Gujarat relief manual”, 1982 (revised in 1987) for carrying scarcity works during natural calamity especially during drought period. A complete review of this manual has been done in the following chapter. In this chapter, a detail profile of the adequacy of drought relief work has been presented. Information on drought relief work has been obtained through primary survey in all the 12 selected villages from 6 districts as mentioned earlier. Adequacy of relief work has been assessed in terms of the extent of availability of work, shortfalls in demand and actual work, adequacy of various activities under relief work and various other issues related to appropriateness of relief works during drought. Gender dimension in relief work has also been assessed to see the conditions of women in drought areas of Gujarat.

Process of relief work in drought

The start of relief work coincides with the declaration of drought at village level. Relief work of government follows the relief manual strictly in carrying out various programmes of activities under it. It has been observed during the field visit that government declares drought on time whenever necessary.

Table 6.1a shows household response on the beginning of relief work, their satisfaction and various type of work that has been carried out during the drought. Out of 530 household 386 (73%) of the household reported start of the relief work which were available for them. On asking whether they are satisfied with the relief work only 47% of the household responded with satisfaction. This indicates that majority of the household are not satisfied with the relief work. However, more than 50% coverage of people for relief work at village level indicates the dire need of “work for wage” during the drought period (see table 6.1.b)

The various type of relief work for employment to rural household were deepening of ponds for both drinking and irrigation purposes, bunding or banking of part, irrigation ponds, road and drainage work, road constructions, check dams etc. However, majority of household (65%) reported deepening of ponds by relief work carried out during drought period followed by 6.42% of household reporting bunding of ponds (see table 6.2). Other activities were not significant as very less number of household reported those work

being carried out during drought relief. These works are generally carried out with participation of rural labours. One of the striking observations is that a good number of female participated in drought relief work. Table 6.3 shows percentage male and female workers participating in drought relief work in drought prone districts in Gujarat.

Female participation in drought relief work

22% of the total female workers in all the 6 districts participated in drought relief work, while about 23% of male reported participating in relief work. Thus, an almost equal number of female took part in all the drought relief activities. However, a significant variation at district level has been observed. Participation of drought relief work in Surendranagar district has been higher by both male and female workers compared to rest of the other districts. Almost 40% of both male and female workers reported participation in drought works in Surendranagar district, followed by Banaskantha and Panchmahal district. Bharuch reported lowest male-female participation. Female participation in drought relief works in Banaskantha has been higher than their male counterparts. Increasing number of female participation in drought relief work has been observed in these areas in Gujarat.

Wage of drought relief work

However wages received by them varies between the districts. It has been observed that 15% of each of the total male and total female gets wages between Rs. 30-39 daily during the drought relief work (See Table 6.4), while 5% of each of the total male and total female gets wages less than Rs. 29 per day during relief work. Only about 2% of the total male and the total female get wages between Rs.40-49. Very few workers get wage of more than Rs. 50. However significant variation in wage has been observed at the district level. About 10% of male and female get comparatively higher wage of Rs. 40-49 in Surendranagar district. This indicates a very less wage differentiation on the basis of gender. Gender discrimination in either participation or in wages has not been observed in drought relief programmes at village level. This could be due to the fact that female in rural areas in drought regions takes part in all economic activities (including relief work) in order to supplement the household income. However, during relief work Female participation has been observed in more number. One of the reason for this could be that most of the relief works are provided within the drought village or near to it so that female could take part easily without travelling a long distance for the search of job

Distance to relief work

Table 6.5 shows distance of the location of relief works across the districts. Altogether 16.7% male and 16% female get their work in their native villages itself. While only 3.8% male and 3.8% female get their work near their village. Only 2% male and 1.6% female reported getting relief work at the nearest villages which are 2 to 5 km away from their own.

District level variation has also been observed. More than 9% male and an equal percentage of female get relief work 2.5 km away from their village in Surendranagar district. It is noted that Surendranagar district has reported highest percentage of participation in drought relief work within their village, followed by Banaskantha. Thus, it has been observed that drought relief works were carried out in the villages, so that

villagers can take part in it, and they can benefit out of it. An estimation of total income out of relief work has been done for all the workers who participated in relief work during last drought.

Income Benefits of relief work

Table 6.6 shows distribution of income from relief work across districts in drought prone areas in Gujarat. Out of 23%, 16% of male that participates in relief work have reported their total earnings less than Rs. 3000 during entire period of relief work, while 16% of the total female that participate in relief work, also earned same amount during the same period. 5% each male and female reported their total earnings in between Rs. 3001 and Rs. 6000. Rest others reported more than Rs. 6000 which is negligible. As it is the beginning of summer each year after the declaration, the relief work becomes a seasonal affair for rural workers. It is therefore, important to know the duration of relief work.

Duration of drought relief work

Generally all relief works are provided for at least 3 months during drought period in peak summer season. Based on our field survey data, (see Table 6.7) maximum number of house holds reported having worked for relief work for 1 to 2 months. However, a significant number of households also reported total duration of relief work of 3 months in their respective villages. Out of 340 households that reported total duration of relief work, 39, 172, 102 and 27 households report total duration of relief work of less than a months, 1-2 months, 3 months and more than three months respectively. In another words 51% of the total households reported duration of relief work of 1-2 months during drought period, followed by 30% which reported at least 3 month relief work in their villages. Thus, a majority of rural households reported total duration of relief work for 1-2 months in drought affected villages in Gujarat.

Adequacy of relief work

Wide gap between the demand of relief work and the actual work carried out has been observed in all the villages in drought areas in Gujarat. Table 6.8 shows the average demand of work days and actual work day provided during the relief work. As per filed survey only 22% population got relief work. Their average demand for wage employment was 111 days, whereas they actually got 67 days of work during the last drought, registering a shortfall of 44 days. This indicates a gross inadequacy of relief work to the villagers during drought period. However, significant variations across the villages have been observed.

Highest shortfall of 77 days has been observed in Kherap villages in Pachmahal districts, followed by Dehri in Bharuch district with 68 days shortfall of relief work. The shortfall in DDP villages except for Kalam (Surendranagar) has been found comparatively lower than those of DPAP villages. This could be attributed, to the fact that DDP areas suffer more on account of frequent drought as compared to DPAP villages. People's demand and for relief work on DPAP villages were higher in anticipation of drought. However, the inadequacies of relief work were real as all the villages reported drought during last five years.

Worksite facilities during relief work

It has been observed that various worksite facilities has also provided to the workers during the relief work. 231 households reported having drinking water facilities at work site, 157 households reported having first aid box and 52 households reported having facilities of shade at the various worksites amongst the 12 villages surveyed (Table 6.7a). Facilities for children and pregnant mother, and crèche were also observed during the field survey.

Relief work: process, benefits and utilization

It has been observed that relief works that were carried out during drought period in affected villages are far from adequate. However, the process of relief work reaches to villages as and when required. Hence 73% of the total household reported the started of relief work in their respective villages (Table 6.8). It has been also observed that major relief works carried out during drought were deepening of ponds both for irrigation and drinking water purposes. The process of relief work has been quite cumbersome as it needs careful planning before the start of the actual works. Work is generally carried out by the individual in a gang on the work site and various processes follows after that till the actual utilization of assets by the villages takes place. A brief process has been described here in order to understand the mechanism of relief work at village level.

Frequency of measurement of work and payment

Individual workers work in a gang and their work are measured weekly (generally). Table 6.9 shows the process of measurement and its frequency. Out of 530 households, 283 reported that relief works were measured on the basis of gang and payments were made weekly (284 hh). The measurement are generally carried out by the Junior Engineers, sometime other village level official and clerk also carries measurement of work. Out of 530 households, 208 reported that measurement of relief work has been carried out by the Junior Engineers, while 42 households reported villages level officers doing the measurement, followed by 27 households which reported clerk doing measurement of relief work in all the 6 districts. Their payments are generally done after the completions of measurements of the work. Record of muster is being kept at the work site, as 271 households reported the record of master at work site during the drought period (Table 6.11)

Frequency and mode of payment

Almost all the households that participated in relief work reported receiving their payment weekly. Thus a weekly payment is made after the measurement of actual work done by them. The payments are made either in cash or in kind (i.e. distribution of grains). Table.6.10a, b, and c show the frequency and mode of payment of drought relief work. Relatively higher number of households have received their wage is grains then cash. Out of 530, 289 households reported receiving their wage in grain while 266 reported having received their wages in cash (see table 6.10 a and b), however an almost equal number of households (265) reported having received their wages both in cash and gracing. Marginal variations across the district have also been observed.

Benefits of relief work

Relief work benefits rural households in various ways. Apart from providing them wage employment, social benefits are who provided to rural households of the affected villages. Social benefits in terms of disable, old and pregnant women getting wage employment are common during drought period under the relief work. 22 households across the 12 villages reported wage employment benefit for disable and old persons of more than 65 years of age. 4 pregnant women reported getting engaged in relief work, in which 3 belong to Surendanagar districts only (see Table 6.12 and 6.13). Free distribution of grains to rural households has also been observed during the last drought. 43 households reported taking benefits of free grains during the last drought. None of the households from Panchmahal and Bharuch district got benefits of free distribution of grain, while 17 households in Surendranagar, 19 in Junagadh, 3 in Kutch and 4 in Banaskantha districts reported receiving grains during drought (see table 6.14). The distribution of grains is generally provided through the fair price shop under public distribution system in their respective villages.

It has been observed during our field survey that performance of fair price shop is by and large up to the mark. Most of the villages reported having fair price shop inside their villages and they are open on a regular basis (Table 6.15). Out of 530 households 460 reported fair price shops being open regular and 455 reported having sufficient stock at the shop (Table 6.16). 462 households reported not having any problems with the fair price shops in their villages (Table 6.17). Thus, it has been observed that the functioning of fair price shops in drought areas of Gujarat has been by and large adequate and up to the mark. However, ground level malpractices at the village fair price shop may not be completely ruled out.

Selection, use and utilization of relief work

Almost all those households which participated in relief work reported completion of their work in the same season. Out of 530, 282 households reported having completion of their relief work in times (see Table 5.18). The type of works that were completed were bunding of irrigation ponds, and deepening of village ponds, roads and drainage, check dams etc. Majority of the households reported completion of either bonding and deepening of irrigation and village ponds for irrigation and drinking water purposes. It is observed earlier that acute problem of drinking water exists in drought prone villages in Gujarat (See Table 6.19). According to rural households the selection of these activities under drought relief works are just fine with them. 356 households out 530 have reported that activities under taken during relief works were fine with them (Table 6.20). Use and utilization of relief work vary in the villages affected by the drought.

Use and utilisation of relief works

Various kinds of utilization of relief works and of resultant social assets, has been observed across these drought prone villages in Gujarat. Out of 530 households 323 households reported usefulness of relief work in various ways by the rural population (See Table 6.21). Table 6.22 shows utilization of social assets created during drought relief work. Majority of the rural households reported the use of social assets particularly the village ponds for the collection of rainwater for both drinking and irrigation purposes.

115 households reported collection of rainwater, followed by 91 households which reported that relief works basically provided them wage employment to sustain their livelihood during the drought period. 43 households reported the use of social assets for getting drinking water, while 32 reported that their livestock would benefit from these ponds. 42 households reported direct benefits to villagers for various purposes. However, only 9 households reported the use of these ponds for irrigational purposes. Thus, indicating that drought relief were limited to short terms relief to villages by providing them employment, and saving them from the serious crisis of drinking water. However, these relief work has not been able to provide rural households a long terms benefits of assured irrigation.

Direct uses of the social assets creted during the drought relief work reveal somewhat different scenario. Table 6.22a shows direct use of social assets in the drought prone districts of Gujarat. Most of the households (112) reported that they use there social assets particularly village ponds and irrigational ponds for the protection of their livestock, followed by 90 households which gets direct benefits from those ponds either for irrigation or for drinking water purposes. 73 households reported using these assets exclusively for irrigation purposes followed by 44 households reported using them for the collection of rainwater (See Table 5.22a). Direct benefits were taken by the villager themselves, however, farmers and those households having livestock also use these assets directly and benefits more compared to rest of the other villages (See Table 6.22b & c).

Conclusions

Drought mitigation and management involves both short term and long-term strategies to deal with the drought prone areas. Long-term strategies have been attempted in India by the Central Governmental initiative. Centre Government initiated two long-term Area Development Programmes namely DPAP and DDP. However, the success of these programmes has been evaluated from time to time and modification was made for their effective implementations at the ground level. Despite little success through watershed development in drought areas in Gujarat, DPAP and DDP area programmes have been unable to reduce or minimise the impact of drought and desertification in the state. The short-term effort of state government in terms of providing relief to rural folks during drought has been far from adequate. It has been evident from the above discussions that relief works are insufficient and have not been able to create long-term social assets, which will reduce or minimise the impact of drought in drought prone areas in Gujarat. There is a need to link the short-term relief work with the long-term strategies for drought mitigation and management.

Annexure: VI

Table 6.1 Availability of scarcity programme during the last drought season

District name	DDP / DPAP villages	Availability of relief work						Total
		Yes	%	No	%	Nr	%	
Surendranagar	DDP	60	96.77	2	3.23	0	0	62
Kachchh	DDP	66	64.08	34	33.01	3	2.91	103
Banaskanth	DDP	85	83.33	9	8.82	8	7.84	102
Junagadh	DPAP	65	80.25	0	0	16	19.75	81
Halol	DPAP	42	77.78	12	22.22	0	0	54
Bharuch	DPAP	68	53.13	22	17.19	38	29.69	128
Total		386	72.83	79	14.91	65	12.26	530

Source: Field Survey, April/May 2006

Table 6.1a Level of satisfaction of drought relief work

District	NR	Yes	No	Total
Surendranagar	4	40	18	62
Kachchh	49	39	15	103
Banaskanth	25	61	16	102
Junagadh	25	45	11	81
Halol	15	18	21	54
Bharuch	63	43	22	128
Total	181	246	103	530

Source: Field Survey, April/May 2006

Table 6.2 Work carried out under scarcity programme

District name	Deepening of ponds		Bordering ponds		Irrigation pond		Road work & drainage work		Road construction		Check dam		NR		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.
Surendranagar	28	45.16	23	37.1	1	1.61	0	0	4	6.45	5	8.06	1	1.61	62
Junagadh	56	69.14	5	6.17	0	0	3	3.7	1	1.23	0	0	16	19.75	81
Kachchh	55	53.4	6	5.83	0	0	0	0	1	0.97	0	0	41	39.81	103
Banaskanth	83	81.37	0	0	0	0	0	0	0	0	0	0	19	18.63	102
Panchmahal	36	66.67	0	0	0	0	1	1.85	1	1.85	0	0	16	29.63	54
Bharuch	68	53.13	0	0	0	0	0	0	0	0	0	0	60	46.88	128
Total	326	61.51	34	6.42	1	0.19	4	0.75	7	1.32	5	0.94	153	28.87	530

Source: Field Survey, April/May 2006

Table 6.3 Male –Female Participation in Relief Work

District	Yes	Total	%
Male			
Surendranagar	70	177	39.55
Junagadh	56	259	21.62
Kachchh	46	286	16.08
Banaskanth	84	306	27.45
Halol	40	167	23.95
Bharuch	49	320	15.31
Total	345	1515	22.77
Female			
Surendranagar	64	162	39.51
Junagadh	48	253	18.97
Kachchh	42	260	16.15
Banaskanth	83	297	27.95
Halol	37	165	22.42
Bharuch	39	295	13.22
Total	313	1432	21.86

Source: Field Survey, April/May 2006

Table 6.4 District wise wage rates received in scarcity programme.

District name	Rate of wage								Nr	%	Total
	< 29	%	30 to 39	%	40 to 49	%	>50	%			
Male											
Surendranagar	29	16.38	20	11.30	17	9.60	2	1.13	109	61.58	177
Junagadh	10	3.86	33	12.74	13	5.02	0	0.00	203	78.38	259
Kachchh	6	2.10	38	13.29	0	0.00	0	0.00	242	84.62	286
Banaskanth	1	0.33	80	26.14	0	0.00	0	0.00	225	73.53	306
Panchmahal	10	5.95	27	16.07	4	2.38	0	0.00	127	75.60	168
Bharuch	19	5.94	29	9.06	1	0.31	0	0.00	271	84.69	320
Total	75	4.95	227	14.97	35	2.31	2	0.13	1177	77.64	1516
Female											
Surendranagar	24	14.81	21	12.96	17	10.49	2	1.23	98	60.49	162
Junagadh	8	3.16	31	12.25	9	3.56	0	0.00	205	81.03	253
Kachchh	7	2.69	34	13.08	0	0.00	0	0.00	219	84.23	260
Banaskanth	1	0.34	79	26.60	0	0.00	0	0.00	217	73.06	297
Panchmahal	10	6.06	22	13.33	2	1.21	0	0.00	131	79.39	165
Bharuch	16	5.42	22	7.46	1	0.34	0	0.00	256	86.78	295
Total	66	4.61	209	14.59	29	2.03	2	0.14	1126	78.63	1432

Source: Field Survey, April/May 2006

Table 6.5 Distance from the location of scarcity programme

District name	Sex	Distance from work place								
		In village	%	Near of village	%	2 to 5 k.m	%	Nr	%	Total
Surendranagar	Male	37	20.9	16	9.0	17	9.6	107	60.5	177
Junagadh		55	21.2	1	0.4		0.0	203	78.4	259
Kachchh		36	12.6	9	3.1		0.0	241	84.3	286
Banaskanth		61	19.9	12	3.9	6	2.0	227	74.2	306
Panchmahal		23	13.8	18	10.8		0.0	126	75.4	167
Bharuch		41	12.8	1	0.3	6	1.9	272	85.0	320
Total		253	16.7	57	3.8	29	1.9	1176	77.6	1515
Surendranagar	Female	32	19.8	17	10.5	15	9.3	98	60.5	162
Junagadh		47	18.6	1	0.4		0.0	205	81.0	253
Kachchh		35	13.5	7	2.7		0.0	218	83.8	260
Banaskanth		60	20.2	13	4.4	5	1.7	219	73.7	297
Panchmahal		21	12.8	16	9.8		0.0	127	77.4	164
Bharuch		34	11.5	1	0.3	3	1.0	257	87.1	295
Total		229	16.0	55	3.8	23	1.6	1124	78.5	1431

Source: Field Survey, April/May 2006

Table 6.6 Distribution of total income from relief activities by various districts

District name	Total income in Rs.										
	100 to 3000	%	3001 to 6000	%	6001 to 9000	%	>9001	%	Nr	%	Total
Male											
Surendranagar	47	27.01	20	11.49	0	0	0	0	107	61.49	174
Junagadh	20	7.72	34	13.13	0	0	0	0	205	79.15	259
Kachchh	35	12.24	9	3.15	0	0	0	0	242	84.62	286
Banaskanth	58	18.95	10	3.27	7	2.29	6	1.96	225	73.53	306
Panchmahal	35	20.83		0.00	0	0.00	0	0.00	133	79.17	168
Bharuch	43	13.44	6	1.88	0	0.00	0	0.00	271	84.69	320
Total	238	15.73	79	5.22	7	0.46	6	0.40	1183	78.19	1513
Female											
Surendranagar	41	25.47	22	13.66	0	0.00	0	0.00	98	60.87	161
Junagadh	23	9.09	25	9.88	0	0.00	0	0.00	205	81.03	253
Kachchh	34	13.08	7	2.69	0	0.00	0	0.00	219	84.23	260
Banaskanth	55	18.52	11	3.70	6	2.02	8	2.69	217	73.06	297
Panchmahal	31	18.79	1	0.61	0	0.00	0	0.00	133	80.61	165
Bharuch	36	12.20	3	1.02	0	0.00	0	0.00	256	86.78	295
Total	220	15.37	69	4.82	6	0.42	8	0.56	1128	78.83	1431

Source: Field Survey, April/May 2006

Table 6.7 Duration of relief work in drought villages.

District name	Name of taluka	Name of village	DPAP />1month village	1 to 3 months	Nr	Grand total	
Surendranagar	Lakhtar	Gangad	DDP	5	13	2	31
		Kalam	DDP	4	24	3	31
Kachchh	Abadasa	Moti sindhodi	DDP	3	19	8	30
		Shuthari	DDP	1	34	38	73
Banaskantha	Vav	Joravargadh	DDP	16	25	12	53
		Limbala	DDP	1	24	11	49
Junagadh	Veraval	Malondha	DPAP	1	20	18	41
		Badalpur	DPAP	0	28	12	40
Halol	Panchmahal	Kansaravav	DPAP	0	15	8	23
		Kherap	DPAP	2	20	9	31
Bharuch	Jambusar	Ankhi	DPAP	0	50	46	97
		Dehari	DPAP	6	2	23	31
Total				39	274	190	530

Source: Field Survey, April/May 2006

Table 6.7a Facility on work site during Relief work

District name	Name of taluka	Name of village	No.of house hold	DrinkiShad ng e work	Facility of Crec rest for children &mother	First aid box	Any other facility		
Surendranagar	Lakhtar	Gangad	31	22	7	2	1	11	0
		Kalam	31	21	6	3	2	12	0
Kachchh	Abadasa	Moti sindhodi	30	14	0	0	0	9	0
		Shuthari	73	13	0	0	0	11	0
Banaskantha	Vav	Joravargadh	53	27	1	0	0	21	0
		Limbala	49	25	0	0	0	16	0
Junagadh	Veraval	Malondha	41	26	13	0	0	22	0
		Badalpur	40	20	11	1	0	12	1
Halol	Panchmahal	Kansaravav	23	13	4	0	0	6	0
		Kherap	31	17	5	0	0	17	0
Bharuch	Jambusar	Ankhi	31	5	2	0	0	2	0
		Dehari	97	28	3	1	0	18	0
Total			530	231	52	7	3	157	1

Table : 6.8 Demand and supply of drought relief work

District name	Name of taluka	Name of village	No.of hh pop. Got work	Avg. Demand days	Avg. Got days	Short falls
Surendranagar	Lakhtar	Gangad	85	112	77	35
		Kalam	49	117	53	64
Kachchh	Abadasa	Moti sindhodi	42	106	59	36
		Shuthari	46	105	69	26
Banaskantha	Vav	Joravargadh	98	103	42	47
		Limbala	69	149	128	36
Junagadh	Veraval	Malondha	61	107	71	61
		Badalpur	43	100	74	21
Halol	Panchmahal	Kansaravav	35	98	45	53
		Kherap	42	129	52	77
Bharuch	Jambusar	Ankhi	69	95	62	33
		Dehari	19	104	36	68
Total			658	111	67	44

Source: Field Survey, April/May 2006

Table 6.9 Nature and frequency of relief work during drought period

District	Nr	Measurement		Payment			Dist / taluka officer	Clark	Junior engine eRs.	Total
		Weekly	Total	Gang	Indiv idual	Total				
Surendranagar	12	50	62	50	0	62	2	15	32	62
Kachchh	59	44	103	44	0	103	8	4	29	103
Banaskanth	36	66	102	66	0	102	17	0	48	102
Junagadh	33	48	81	48	0	81	0	0	47	81
Halol	19	35	54	34	1	54	9	3	22	53
Bharuch	87	41	128	41	0	128	6	5	30	128
Total	246	284	530	283	1	530	42	27	208	529

Source: Field Survey, April/May 2006

Table 6.10 Duration of payment of Relief work

District	Nr	Weekly	Monthly	Other	Total
Surendranagar	12	49	1	0	62
Kachchh	59	43	0	1	103
Banaskanth	36	66	0	0	102
Junagadh	33	48	0	0	81
Halol	19	35	0	0	54
Bharuch	87	41	0	0	128
Total	246	282	1	1	530

Source: Field Survey, April/May 2006

Table 6.10a Wages in grain for Relief Work

District	Nr	Yes	No	Total
Surendranagar	12	0	50	62
Kachchh	59	0	44	103
Banaskanth	30	0	72	102
Junagadh	33	0	48	81
Halol	19	1	34	54
Bharuch	87	0	41	128
Total	240	1	289	530

Source: Field Survey, April/May 2006

Table 6.10b Wages in cash for Relief Work

District	Nr	Yes	No	Total
Surendranagar	12	18	32	62
Kachchh	59	1	43	103
Banaskanth	30		72	102
Junagadh	33	2	46	81
Halol	19	1	34	54
Bharuch	87	2	39	128
Total	240	24	266	530

Source: Field Survey, April/May 2006

Table 6.10c Wages in Cash & Grain for Relief Work

District	Nr	Yes	No	Total
Surendranagar	12	32	18	62
Kachchh	59	43	1	103
Banaskanth	30	72		102
Junagadh	33	46	2	81
Halol	19	33	2	54
Bharuch	87	39	2	128
Total	240	265	25	530

Source: Field Survey, April/May 2006

Table 6.11 Record in Muster Book During Relief Work

District	Nr	Yes	No	Total
Surendranagar	12	44	6	62
Kachchh	60	43		103
Banaskanth	39	62	1	102
Junagadh	33	46	2	81
Halol	19	35		54
Bharuch	87	41		128
Total	250	271	9	530

Source: Field Survey, April/May 2006

Table 6.12 Disable / Old Person In Households, Getting Relief Work

District	Nr	Yes	No	Total
Surendranagar	12	7	43	62
Kachchh	57	1	45	103
Banaskanth	30	2	70	102
Junagadh	33	5	43	81
Halol	16	5	33	54
Bharuch	41	2	85	128
Total	189	22	319	530

Source: Field Survey, April/May 2006

Table 6.13 Number Of Disable And Pregnant Women

District	No. Of disable	No. Of pregnant women	Total
Surendranagar	3	3	62
Kachchh	0	0	103
Banaskanth	1	0	102
Junagadh	1	0	81
Halol	3	1	54
Bharuch	0	0	128
Total	8	4	530

Source: Field Survey, April/May 2006

Table 6.14 Free Distribution Of Grain During Relief / Scarcity Work

District	Nr	Yes	No	Total
Surendranagar	10	17	35	62
Kachchh	38	3	62	103
Banaskanth	25	4	73	102
Junagadh	33	19	29	81
Halol	0	0	54	54
Bharuch	36	0	92	128
Total	142	43	345	530

Source: Field Survey, April/May 2006

Table 6.15 Regularity Of Fair Price Shops

District	Nr	Yes	No	Total
Surendranagar	2	60		62
Kachchh	5	97	1	103
Banaskanth	6	96		102
Junagadh	12	63	6	81
Halol	2	48	4	54
Bharuch	7	96	25	128
Total	34	460	36	530

Source: Field Survey, April/May 2006

Table 6.16 Sufficient Stock In Price Shops In The Villages

District	Nr	Yes	No	Not more	Total
Surendranagar	2	56	3	1	62
Kachchh	5	98			103
Banaskanth	6	96			102
Junagadh	12	64	5		81
Halol	2	41	7	4	54
Bharuch	7	100	19	2	128
Total	34	455	34	7	530

Source: Field Survey, April/May 2006

Table 6.17 Any Problems With Fair Price Shops Faced By The Villages

District	Nr	Yes	No	Total
Surendranagar	2	8	52	62
Kachchh	5	1	97	103
Banaskanth	6	2	94	102
Junagadh	12	7	62	81
Halol	2	6	46	54
Bharuch	7	10	111	128
Total	34	34	462	530

Source: Field Survey, April/May 2006

Table 6.18 Completion Of Relief Work On Time.

District	Nr	Yes	No	Total
Surendranagar	5	46	11	62
Kachchh	39	47	17	103
Banaskanth	17	77	8	102
Junagadh	25	52	4	81
Halol	15	27	12	54
Bharuch	63	33	32	128
Total	164	282	84	530

Source: Field Survey, April/May 2006

Table 6.19 Type Of Relief Work, Carried Out During Drought Period.

District	NR	Deepening of ponds	Bonding of ponding	Irrigation pond	Road work & dma, drainage work	Cheak bonding	Total
Surendranagar	15	22	20	1	3	1	62
Kachchh	66	0	36	0	1	0	103
Banaskanth	25	18	59	0	0	0	102
Junagadh	40	37	4	0	0	0	81
Halol	24	19	10	0	1	0	54
Bharuch	96	1	31	0	0	0	128
Total	266	97	160	1	5	1	530

Source: Field Survey, April/May 2006

Table 6.20 Satisfaction Of Relief Work By The Villagers.

District	NR	Yes	No	Total
Surendranagar	6	55	1	62
Kachchh	27	63	13	103
Banaskanth	17	82	3	102
Junagadh	26	55	0	81
Halol	15	38	1	54
Bharuch	63	63	2	128
Total	154	356	20	530

Source: Field Survey, April/May 2006

Table 6.21 Use Of Assets By Rural HH

District	NR	Yes	No	Total
Surendranagar	5	45	12	62
Kachchh	25	65	13	103
Banaskanth	14	87	1	102
Junagadh	24	56		80
Halol	16	36	2	54
Bharuch	94	34		128
Total	178	323	28	529

Source: Field Survey, April/May 2006

Table 6.22 Utilization Of Village Social Capital Created By Relief Work

District	NR	Get drinkin g water on	Get irrigati on water	Get emplo yment for drought priod	Collection of rainwater for drought priod	Benefits all villegers	Proteti on for animal s	Others	Village develop ment	Total
Surendranagar	10	0	4	10	10	14	9	1	2	60
Kachchh	41	0	0	33	15	14	0	0	0	103
Banaskanth	19	17	0	22	33	1	10	0	0	102
Junagadh	42	4	2	12	17	2	2	0	0	81
Halol	17	1	3	3	14	11	5	0	0	54
Bharuch	63	21	0	11	26	0	6	0	0	127
Total	192	43	9	91	115	42	32	1	2	527

Source: Field Survey, April/May 2006

Table 6.22a Utilisation Of Social Assets

District	NR	Get drinkin g water on	Get irrigati on water	Collection of rainwater for drought priod	Benefits all villegers	Proteti on for animal s	Village develop ment	Total
Surendranagar	15	0	3	5	9	30	0	62
Kachchh	41	1	9	4	47	1	0	103
Banaskanth	15	0	24	28	6	29	0	102
Junagadh	23	0	26	0	19	11	1	80
Halol	18	0	8	7	9	12	0	54
Bharuch	93	3	3	0		29	0	128
Total	205	4	73	44	90	112	1	529

Source: Field Survey, April/May 2006

Table 6.22b Utilization Of Social Assets

District	NR	Villager	Farmers	Animal Husbandry	Total
Surendranagar	15	42	5	0	62
Kachchh	66	11	12	14	103
Banaskanth	18	31	2	51	102
Junagadh	23	33	23	1	80
Halol	19	10	14	11	54
Bharuch	92	34	1	1	128
Total	233	161	57	78	529

Source: Field Survey, April/May 2006

Table 6.22c Utilisation Of Social Assets

District	NR	Villager	Farmers	Animal Husbandry	Total
Surendranagar	61	1	0	0	62
Kachchh	30	0	0	0	30
Banaskanth	74	2	3	23	102
Junagadh	80	0	0	0	80
Halol	48	5	0	1	54
Bharuch	125	0	0	3	128
Total	418	8	3	27	456

Source: Field Survey, April/May 2006

Chapter Seven

**Drought Mitigation and
Management Policy in Gujarat**

Chapter Seven

DROUGHT MITIGATION AND MANAGEMENT POLICY IN GUJARAT

Introduction

Droughts in Gujarat are fairly a regular phenomenon, which occurs in frequent intervals in almost all part of the State. It is observed that every third year is a drought year in Gujarat (Hirway, 2001). However, droughts are considered as natural calamity hence relief measures are provided as and when required. This is the perspective of droughts in the state. The approaches to tackle drought follow the British legacy, which is based on the Drought Relief Manual of 1982 (Currently under revision) in the state. Nonetheless, there is an increase in the frequency of occurrence and intensity of droughts in the country especially in drought prone area due to a) depletion of water resources, b) loss of vegetation cover, c) degradation of land and d) overall depletion and degradation of environmental resources (Mathur and Jayal, 1993). The fluctuating nature of rainfall further leads to more severe degradation of natural resources, unstable agriculture production and insecurity of food and livelihood (Rao, *et.al.*, 1988, Sainath, 1996). Possibility of more frequent and widespread drought can not be ruled out in coming years (Sivasami, 2000) as the pattern of rainfall is likely to change due to reducing rainy days over the years. This would lead to reduced water availability in the state. Thus, the frequency and intensity of drought also depends on management of water resources, land and forest in the region.

Overcoming drought condition needs clear understanding of droughts and accepting it as a regular episode. Droughts should not be treated as separate and occasional phenomena to be dealt with as and when they occur, but rather as another constraint in the design of policies for long term rural development strategy (Khera, 2005¹). Drought may not be seen as mere physical phenomenon any more as each drought produces a unique set of impacts, depending on its severity, duration, spatial extent, and also on ever-changing socio-economic conditions (Govt. of Orissa and UNDP, 2006².) The occurrence of droughts has been frequent and its intensity is very complex and involves multidimensional understanding. Its complex nature and far reaching consequence lead to negative impacts on economy, ecology and human well-being in a region. Therefore, fighting drought needs a comprehensive approach which can take care of both its short term and long term impacts.

¹ Khera, R., 2005, "Drought Proofing in Rajasthan: Imperatives, Experience and Prospects," Discussion Paper Series – 5, UNDP, India, New Delhi

² Govt. of Orissa and UNDP, 2006, "Community based Drought Preparedness Plan," UNDP India, New Delhi

Since, drought is related to agriculture and rural development, it becomes a matter of state subject. However, overall policy guidelines of centre government provide framework for drought mitigation policy formulation in the state. Gujarat largely follows the central government policy framework for its drought relief measures in the state. It is important to discuss overall drought policy in India before we discuss the present drought relief measures in Gujarat.

Drought Policy in India: A Brief Review

History of drought policy is very old in India. Muhammad Tughlakh was perhaps the first Sultan to take systematic steps to alleviate the effects of droughts (Loveday 1985). He distributed grains to people in Delhi for six months during the famine of 1343 A.D. He also gave loans to farmers and started relief works to provide employment to affected people. Mughal emperors were much better in this matter. They provided grains to people even outside Delhi, in Gujarat, Rajasthan and Malwas and started relief works for the poor. They also waived land revenue, increased recruitment in army and promoted deepening of ponds and digging of wells during famines. Similar kind of relief measures was also taken by Avadh ruler Nawab Asaf-ud-Daula in Central Province in India. He built the Bara Imambara (after shifting his capital from Faizabad to Lucknow in 1775) with its intricate *bhul-bhulayya* and adjoining mosque, primarily to create employment for his subjects during a time of drought (District Profile of Lucknow, 2006³).

Famines continued due to drought in British India. In fact, as economic historians have observed, there was an alarming increase in the frequency of famines during the British Period (Bhatia 1967). Scarcities were defined as “events of significant losses in agricultural production arising from inadequate rainfall or floods or pest attacks, leading to severe unemployment and consequent suffering of agricultural population, particularly agricultural labourers and small farmers.” The first Famine Commission was set up in 1868 after the droughts in Orissa in 1865-67 to examine the causes and effects of the famine. Another Commission was set up in 1880, and both the reports agreed to certain principles in fighting famines on the basis of a) deaths of human being need to be prevented under famines, b) tagavi loans need to be given to farmers to enable them to cultivate land in the next season, c) employment avenues may be opened up through relief works for affected people and d) the government may take up the responsibility of helping famine affected people though not beyond a limit.

The first Temporary Scarcity Manual was prepared by the British government of India in 1883. Provincial governments were asked to prepare their own manuals using this Central Manual. Several Famine Commissions were set up thereafter and scarcity manuals were revised. Princely states were also asked to prepare manuals or rules for providing famine relief. While some of them did not do much, others went beyond these manuals to help people. Some of the principles, which got adopted for famine relief during the British Period, can be listed as follows:

- ❑ Famines are a major natural disaster in India where agriculture is the main economic activity for people. Since famines result in sufferings of agricultural population, there is a need to help them during the period of famines.

³ <http://lucknow.nic.in/History.htm>

- ❑ Farmers may be helped by waiving of land revenue and by Tagavi loans to enable farmers to cultivate lands in the next season.
- ❑ Owners of milch animals may be helped by procuring and distributing fodder, and by setting up animal camps or Panjarapoles.
- ❑ Relief works may be started for creating work for people. Such works could be related to road construction, irrigations, village level facilities, etc. as well as to self employment.
- ❑ Cash doles may be given to the old, disabled, widows and destitutes — who cannot take part in relief works.
- ❑ A special fund was created for natural disasters (1878), which was to be used for famines whenever needed.

There was always a big gap between what was laid down in manuals and what was actually implemented. The sufferings of people did increase with the increased frequency and intensity of famines (Bhatia 1967, A Loveday 1985, Doddwell 1963). However, these principles are still there in the present scarcity manuals.

The approach of the Central Government towards droughts in India at present has three major components:

- ❑ Drought/Scarcity relief works
- ❑ Drought prone area development programmes, i.e. special programmes designed to develop drought prone and desert prone areas
- ❑ Promotion of dry farming agriculture as a part of agricultural policy

The first component addresses the crisis or the misery of drought affected people. The second component is an area based approach that aims at developing targeted areas that are suffering from frequent droughts and the third component is a general approach for developing agriculture in drought prone areas. It is necessary that all the three components are integrated into a comprehensive drought policy. However, the experiences show that such a policy has not emerged so far. While the second and the third components are gradually coming together, the first component is still more or less independent of the other two, resulting in diffusion of the total efforts.

“Drought is not a disaster, but a management issue,” has been declared by a representative of Government of India in UNDP Sub-Regional Seminar on Drought Mitigation on 28-29th August, 2001 in Tehran. This is clearly a realization of ground reality which needs to be reflected in a long term drought area developmental policy in India. The current approaches aims at reducing the short term impact of drought by providing relief measures.

Drought Relief Policy in Gujarat

Drought in Gujarat is considered as natural calamity which demands immediate attentions as and when it happens. Department of revenue, Government of Gujarat acts as nodal agency to look into the relief measures after the drought is declared. It follows an official manual to tackle the scarcity arising out of drought condition in the state or in the

part of state. The Gujarat Relief Manual, 1982 revised in 1987 has been in place for long to handle the scarcity situation in the state. Further revision is still underway with Gujarat State Disaster Management Authority (GSDMA).

Drought as Scarcity

Thus, the condition of drought in the state brings situation of scarcity in the affected areas. According to the manual, “scarcity is a marked deterioration of agriculture season due to the failure of rains or floods or damage to crops from insects resulting severe unemployment and consequent distress among agriculture labour and small cultivators.” This definition focuses on the scarcity condition arising out of drought only for short term measures. The regional categorisation of scarcity conditions due to drought takes into account immediate relief measure on a priority basis. It lacks long term perspective of drought proofing and its mitigation. The following are the classification of scarcity areas as mentioned in the relief manual:

1. Chronically hit areas, where situation demands personal attention of the Collector may be accorded first priority
2. Other areas which are affected by scarcity in successive years may be given second priority and
3. The rest of the area affected may be given third priority.

Approaches to Scarcity

If one examines the approaches to scarcity works under drought condition in the state, they reveal that the entire process is short term and does not take into account the multiple impacts of drought in a perpetually drought areas. A list of selective approaches to scarcity work may include the following measures (Gujarat Relief Manual, 1982: p14):

- a) more food grains for the persons employed on scarcity works and others,
- b) distribution of fodder,
- c) priority in drinking water,
- d) gratuitous relief to more families,
- e) voluntary agencies may requested to pay more attention,
- f) more liberal use of the Chief Minister’s Relief Fund,
- g) more medical care and more vitamins/tonics and
- h) priority in distribution of milk powder, butter milk, onions, potatoes, sukhadi etc by voluntary agencies

The above mentioned relief measure are taken for a stipulated duration of 4-6 months i.e. for one drought season only. This does not guarantee the continuation of work for the next season.

Planning of relief and scarcity work

There are many inherent problems in understanding the impact of drought in the present policy that needs not only the short term scarcity relief but also the long term drought proofing so that an effective mitigation and management of drought affected area can be taken up. The manual further details out the list of work to be taken up during drought relief, these are:

- Medium and Minor Irrigation works
- Forestation and plantation work
- Road repair, broadening of roads and construction of new village approach road
- Metal breaking
- Land development, soil conservation, bunding etc
- Water conservation works- village level tanks ponds, wells etc and
- Khadhi and Amber Charkha

A shelf of projects for these many works should be kept ready at the district so that they can be taken up during the drought period. However, it has been reported that the relief measure are usually not planned in advanced and are executed in a piece meal manner (Kutch Mahila Vikash Sangathan, 2004⁴). They are a set of randomly prepared projects without any long term strategy of drought proofing of the affected regions (Hirway, 2001). In fact, however, it never be a drought proofing approaches as they are taken up for short period, whereas drought proofing needs an integrated approaches with relatively longer period of time durations. Even the selection of irrigation or a natural resource project from such a shelf of project may not generally contribute to land and water resource development in the state. “Digging the same well” syndrome has been a general practice of relief work in the state.

Execution of relief and guarantee of work

The declaration of drought is based on rather a tedious and cumbersome job of Collector. The office of the collector is assigned to send the report of drought situation in his or her taluka based on a system of yield deviation from normal year. This system is called ‘Annabari’⁵. Generally Annabari of 4 and above of particular villages is declared as drought affected. The system also has a provision of declaring partial drought wherever crop losses are less severe- with an *annabari* of less than six. Thus an aggregate at Taluka and District is also calculated and report thus sent to relief commissioner of the state. After receiving the report from collectors, drought is declared in respective districts. This is a cumbersome and lengthy procedure involving 25 steps, leaves scope of red tapism and manipulations by vested interests. There is urgent need to simplify the system of assessment of drought declaration of relief work.

⁴ Kuch Mahila Vikash sangathan. 2004, ‘Towards a Policy of Disaster Mitigation in Recurrent Drought Regions,’ A report by Astad Pastakia, Consultant, Natural Resource Management, Bhuj, Gujarat.

⁵ Annabari refers to the old system of currency in India in which One Rupee in was equal to Sixteen annas. Hence, in Annabari system, 4 annas means 25 %, 8 annas was equivalent to 50 % and so on.

Preparation of relief works also takes time in printing identity cards, identifying shelf of projects, identifying location and type of work etc before the start of relief work. The entire process takes time and further aggravates the drought conditions in the region. However, since there is no legal guarantee of scarcity works villagers have left with no choice but to wait for the relief work to come to their villages. There is no guarantee that the supply or employment, water and fodder are always adequate.

Constrains of financial power and participation of relief works

In order to reduce the time lag, collector is empowered to open relief work in affected area without prior approval of the state government provided the amount of project should not exceed Rs. 5 lacks (This is under revision.) The revised relief manual is not available for consultation at the time of writing this report. However, it is expected that a substantial rise in this amount say Rs. 25-50 lakhs may be earmarked. This puts constrains on the part of relief mechanism. It may also happed that the sanction amount gets over before the drought season or the demand for work may exceed and fund are not enough to may the wages.

There are also many constrains on part of government policy which restricts the participation of people in the relief work. There is a provision of only a) 50 per cent of family workers of each household in a village to be given relief work at the time of drought, b) workers are allowed to work for 5 day a week, c) minimum wage are not generally given during the scarcity work, d) wages are based on the SOR (Statement of Rates) of PWD and payment are made on the basis of quantum of work done by the workers, e) works on the relief site has to be unskilled manual work etc. These entails that the relief work are not for all who are willing to work. The old, women and those who are unable to do unskilled hard manual work may not get work during relief period. Even if they are offered they get meagre amount as wage which may not be sufficient for them (UNICEF, 200; DISHA, 2001). This leaves scope for malpractices at the ground level. Report (Kuch Mahila Vikash Sangathan, 2004) from field endorses such practices and inherent lacuna of present drought relief works.

Despite inherent weakness, the relief manual provides an elaborate mechanism for scarcity work. One of the major roles of drought policy is to reduce the risk of vulnerability of agriculture households by providing immediate relief in terms of drinking water, food, employment, and prepared them by providing Tagavi loan for the next season.

'Tagavi' loans and Subsidies to farmers

Loans are granted to famers, *Maldaries*⁶, cattle owner and local bodies for fodder both dry foddors and raising green fodder and concentrates, seeds and bullocks, *khavti*, *Kos-varat*, well and bore well construction for irrigation, drinking water supply by municipality and maintenance of livestock. Subsidies are generally granted for irrigation, soil conservation and replacement of cattle which died in drought. The interest rates based on current market are applicable on the total amount of loan. Farmers are given 50-75 per cent of subsidies on total cost of project both for irrigation and soil conservation.

⁶ *Maldari* refers to all pastoral caste in Gujarat who owns livestock. It comes from 'mal' meaning livestock as assets or wealth and 'dhari' the owners of the same. They are found in all parts of Gujarat.

The loan and subsidies are subjected to a maximum limits which may not be sufficient for the rural households. According to old rates in Gujarat Relief Manual, Rs. 2500 can be given to farmers as Tagavi loan and a 50 per cent subsidy on each irrigation well subjected to the maximum of Rs. 245 per well. There are no other criteria of distribution of loans and subsidies in the manual. The loans are given in kind and are administered by Cooperative Banks under Land Improvement Loan Acts and the Agriculturist' Loan Act of the state. All the loans are given against the collaterals thereby leaving no hope for small and land less agriculture labour to get the benefits. They are the worst sufferers.

The administrative process and insufficient funds restrict the process of loan disbursement on time. Farmers usually concentrate on traditional coping mechanism to compensate the loss of their livelihood during drought. Informal loan market plays a vital role in providing financial support to farmers. They are generally trapped in debt due perpetual drought in dry regions of Gujarat. Tagavi loans and subsidies have limited role in providing drought proofing in the state.

Provision for the maintenance of Cattle

Cattle camps are organised either by the state government or by the private/trust and voluntary organisations. There is a provision of fodder and veterinary services to cattle. Camps are organised at suitable places not at each village. However, the categories of cattle mentioned in the relief manual considers only:

- a) essential- required by the owners for the purposes directly connected with agriculture such as working bullocks, pregnant and milch cows, breeding bull etc.
- b) non-essential- those cattle which are not essential for agriculture such as dry cows, dry buffaloes and bullock, young stocks of cows and buffaloes and
- c) useless – those which are too old to maintained

There is no mention of any other categories of livestock to be taken care of during the drought relief. Whereas a considerable amount of rural population including small farmers and *maldharies* depends for their livelihood on other livestock as well. Goat, sheep and camel are major livestock in the state that suffers equally during the drought found no place in the maintenance policy of livestock in drought policy of Gujarat! These livestock provide tremendous supports to farmers and others for their livelihood in dry regions of the state. Immediate attention need to be given on a comprehensive livestock development policy in the state and their contingency plan during the emergencies in drought and other natural calamities. Fodder, water and fuel (firewood) are essential part of agriculture households in rural Gujarat. During drought the hardship of household increases as these essential commodities becomes scares.

Women and Drought relief work

Environmental degradation due to drought affects rural households and particular women in dry regions. The essential resources (such as water, fodder and firewood) become scarce during drought conditions. Generally, women are closely associated with the activities that ensure fuel, fodder and water in the household. Women need to put extra effort to arrange these commodities thereby increase their total unpaid work in their household. Coping strategies of drought affects women adversely as they reduces food intake and put extra hard work to mitigate the impacts of drought in household. In this

process they loose out on their nutritional intake and suffer with severe malnutrition in dry regions (Shah⁷, 2006). These are some of the issues that are completely missing in the present drought relief policy in the state.

Following are the broad areas that have not received adequate attention of policy maker so far in the state:

- A) Drought and Environmental Degradation
- B) Droughts and Human Development
- C) Drought and Copping strategies of drought-affected population and
- D) Mainstream Development of Dry Regions

Therefore there is a need to develop an alternative approach to drought relief measures with drought proofing. The first step in this regard would be to change the exiting perception of drought in the state, and develop linkages between drought relief and drought proofing. It is however, possible to combine the drought relief works with drought proofing in a systematic way. Once the droughts are accepted as a fairly regular and internal phenomenon and affected by policy related to natural resource management one does not really worry about providing relief when it occurs for a limited period. Drought management policy has to be a long term efforts with all the measures of drought proofing at regional levels.

Drought Relief and Drought Proofing

There are many such restrictions that come in the way of drought proofing with the present relief measures of the state. These are a) perception of drought as natural calamity which occurs in uncertain manner, b) impacts of drought on natural environment and c) impacts of drought on human development of affected regions. These areas have received inadequate attention in the policy which makes it difficult to take long term drought proofing measures in the state. However, efforts have been taken up by the Central government to mitigate drought through integrated area development programmes called 'Drought Prone Area Development Programme (DPAP) and 'Desert Development Programmes (DDP). These are comprehensive strategies for drought proofing through water harvesting and irrigation and water resource management. These two programmes are sponsored by the central government which takes into accounts water and soil conservation along with employment generation in drought prone areas.

DPAP and DDP Programmes

Relief measure of drought prone areas has not helped solve the basic problems of reduced / low productivity of drought regions by conserving soil and moisture thereby reducing the impact of drought on human and cattle. This lead to severe ecological degradation on account of denudation of forest and excessive grazing resulting in reduced land productivity. Systematic long term drought proofing efforts were launched during 1973-74 (DPAP) and 1977-78 (DDP) with a view to creating assets designed to reduce the

⁷ Shah, Mihir., 2006, 'The Problem,' The Forsaken Dryland-a symposium on some of India's most invisible people. Seminar, vol. 564, August 2006

impact of drought. A detailed coverage of area under these two programmes in the state has been dealt in earlier chapter and the results so far have not been satisfactory.

Following are the main objectives of both the programmes:

- Minimizing adverse effects on crop productivity, livestock, water and human resources;
- Promoting economic development of the poorer section through creation and equitable distribution of productive resources;
- Increasing the employment opportunities through sustainable livelihood; and
- Reduce the ecological degradation and desertification in the perpetual drought regions.

The programme also aims to promote overall economic development and improving the socio-economic conditions of the poor and disadvantaged sections inhabiting the programme areas. However, approach adopted so far under these programmes, is integrated and comprehensive involving soil and water resources development on watershed basis, afforestation, and pasture development. But the results have been not encouraging. Subsequent evaluation of these programmes reveals that projects under DPAP and DDP have not resulted in raising productivity and conservation of soil moisture to reduce the adverse impact of drought and check the desertification in India including Gujarat.

Throughout the lifespan of these programmes there has been as many as 5-6 evaluation committees⁸ which have recommended various changes in concepts, performance, implementation mechanism, and institutional arrangements. Till 1994, DPAP and DDP were being implemented on sectoral basis where major activities like soil-moisture conservation, water resource development, afforestation, pasture development etc. were taken up in fragmented manner by different line departments. Isolated implementation of wide ranging sectoral activities over widely disjointed areas of very small sizes failed to bring about any noticeable impact and programme objectives were remained farfetched. However, the programmes were reviewed in 1994 by a High Level Technical Committee under the Chairmanship of Shri Hanumantha Rao.

Major policy changes took place on the recommendation of Prof Hanumantha Rao Committee. Followings are the major recommendations of the Committee:

- (a) The Committee recommended development of lands, water and vegetative resources on watershed basis in the area development programmes including IWDP.
- (b) The treatment for the watershed should include all categories of land including private, village commons, revenue and degraded forest lands.

⁸ The committees are 1. Task Force headed by Dr. B.S. Minhas (1973); 2. Task Force headed by Dr. M.S. Swaminathan (1982); 3. Inter Departmental Group Task Force (1984); 4. National Committee on DPAP and DDP headed by Y.K. Alag/L.C. Jain; 5. Technical Committee on DPAP and DDP headed by Prof. C.H. Hanumantha Rao (1993), and 6. S. Parthasarthy Technical Committee on Watershed Programme (2005)

- (c) A micro-watershed with about 500 ha. may be taken up for management and development.
- (d) Watershed development programme should be implemented with the total participation of the beneficiaries.
- (e) Awareness rising including dissemination of relevant information relating to the programme should be given priority.
- (f) State and District Level Committees be constituted to monitor the programmes.
- (g) States should also contribute a suitable matching share in watershed development schemes.
- (h) Training at various levels for the preparation of Watershed Development Plan should be arranged.
- (i) For identification of blocks to be covered under DPAP and DDP, the criteria of moisture index, three eco-systems - arid, semi-arid and dry sub-humid and area under irrigation may be taken into consideration.
- (j) It is necessary to organize independent evaluation studies on a regular basis through reputed independent and autonomous

Based on the above recommendation uniform guidelines for all the three programmes i.e. DPAP, DDP and IWSD were formulated. Both sectoral and area development were given importance to these programmes. The Government attached utmost importance for development of waste and degraded lands by increasing their productivity following the principle of equity, transparency and community empowerment by adopting low-cost locally available technology and material. These guidelines were in operation for a period of over six years. (Details of guidelines are given in Annexures1).

DPAP and DDP programmes are being implemented in Gujarat as per the guidelines of central government. The integrated area development plan with DPAP, DDP and IWSD are in place in the state for the last decade after revised guidelines were implemented. So far the state share of total budget in India for DPAP is almost 10 per cent. 18606.46 lakhs rupees have been sanctioned by the central government so far under DPAP in the state. Almost 6 per cent of total DPAP areas of the country fall in Gujarat.

However, the performance under these schemes has so far been not satisfactory in the state. This has been largely due to a) lack of convergence of other rural and agriculture development programmes at ground level, b) the projects were implemented in isolation and in disjointed manner, c) management of projects failed due to lack of inter departmental coordination, d) projects under these programmes become too large over the years to handle, and e) large scale malpractice has been observed at ground level. Nonetheless, the projects under the supervision of NGOs and local CBOs have shown some good results in achieving the goals of intergrated watershed development programmes thereby reducing the impact of drought the state. Kutch Mahila Vikash Sangathan during 2003-04 has done an experiment of drought proofing in Kutch -one of the worst drought regions in the country. The results are very positive in terms of drought proofing and coping strategy of community during drought. The detailed case has been presented in the Annexure 2.

Mainstream Development of Dry-land Region: An Alternative Policy

Watershed Development Programme

Drought proofing through Watershed Development Programme (WDP) approach has been in place in the country for a long period. Watershed approach aims at bring soil conservation measures, water conservation and storage measures, dryland farming, animal husbandry, forestation and minor irrigation as the minimum number of discipline under a coordinated approach. However, panacea of watershed development approaches in the dry lands of India particularly in Gujarat has been giving mixed results. This approach is a holistic approach which takes into account natural resource management and enhancement of livelihood in dry regions. This is also an integrated approach at micro, meso and macro watershed level for the development of land, water, forest, fodder (pasture), in such a manner that ensures efficient resource utilisation. This programme provides equal access to resource use and sharing of benefits for sustainable development of dry land.

The implementation of the programme is difficult and very complex at ground level. However, one can expect that this programme would generate massive employment in drought prone areas in initial stage as these works are highly labour intensive (Hirway, 2001). This is likely to reduce seasonal out migration of the region. The improvement in availability of employment is likely to push agriculture wage upwards which will lead to improvement in levels of living in rural households. Reduction in out migration will improve the access to better education, health and welfare programmes of the state in long run thereby ensuring the better human development in dry lands of Gujarat.

After a decade of review by Hanumantha Rao Committee, the Ministry of Rural Development of India considered appropriate to constitute a technical committee to review the watershed programmes to address the issues highlighted in the Impact Assessment Studies and to reassess the criteria of moisture index (recommended by Hanumantha Rao Committee) and reidentify the blocks under DPAP / DDP for biotic and climatic changes during the period.

The Committee has submitted the report.

Parthasarathy committee on DPAP, DDP and IWDP

Salient features of report:

- Dryland regions of Indian has suffered due to lack of attention
- Financial Resource has been abysmal
- Totally top down in implementation
- Rigid bureaucratic system of project execution
- Participation of grass root agencies and local NGOs is needed
- Massive investment proposal for dry land development to the tune of Rs.10,000 crores annually for the 15 years

- Creation of National Authority of Sustainable Development of Rainfed Areas (NASDORA). It should be a quasi-independent authority to manage the watershed programme. It must be endowed with autonomy and flexibility to respond innovatively to local needs and must have clear accountability for performance. The proposal is for setting up a totally new professional and output-oriented organisational structure geared to meet this requirement.

Vulnerability and Potential of Dry Land in the state

In Gujarat more than 50 per cent of the total area of the state is under dry land agriculture. 16 out of 25 districts have been covered under DDP and DPAP programme for IWSD. Problem of desertification due to low amount of rainfall with high fluctuation further puts pressure on dry land agriculture in the state. The amount of rain fall varies from 300 mm in Kutch to more than 2000 mm in Dang. The wide range of variation in the rainfall results in low productivity of crops especially food grains, leading to acute food crisis during drought period. Therefore, food insecurity in the state particularly in dry region and tribal dominated eastern hilly regions is a major concern for state government as the insecurity of food reaches it peak in summer (Chakravarty and Dang, 2006⁹). Recent study by Singh and Bhogal¹⁰, (2006) reveals that the state is having deficit production of food grains and pulses which are likely to increase by the year 2010-11. The study further reveals that the net deficit of cereals in the state will be 4463.61 thousand tonnes in the 2005-06 which will increase to 4639.16 thousand tonnes during 2010-11. This is a grave situation that the state is likely to face in the near future, if the implication of agriculture drought is not taken seriously at policy level.

However, despite these constrains Gujarat has been amongst the leading producer of groundnut and cotton in India. These two crops are by and large produced in dry regions of the state are of high commercial value. The potential for development of dry land agriculture particularly of these two crops are tremendous in the state. Full potentials of these crops have not been yet utilized in the state. Scientific inputs and extension services are needed along with huge public investment for the development of dry land agriculture in the state.

Dry-land agriculture has scope for increasing employment with growth. It has advantage of crop specific growth with adequate scientific inputs. It also has tremendous scope for increasing productivity which bring down poverty with diversification of economic activities more than the rainfed regions where agricultural growth has saturated (Shah¹¹, 2006)

Some of the policy recommendations are given in the following

1. Complete revision of existing drought relief manual
2. Watershed development approaches to continue

⁹ Chakravarty, S. and S. S.A. Dang, 2006, 'Food Insecurity in Gujarat: A Study of Two Rural Population,' Economic and Political Weekly, June, 3.

¹⁰ Singh, Gajendra and T.S. Bhogal, 2006, 'Assessment of Food Security Situation for Disaster Risk Management: An Analysis for the Gujarat State, Anvesak, Vol. 36 (1) Jan-June

¹¹ Shah, Mihir., 2006, 'The Problem,' The Forsaken Dryland-a symposium on some of India's most invisible people. Seminar, vol. 564, August 2006

3. Dry –land agriculture development should be given priority
4. Improvements in rural banking system
5. Formalisation of credit institutions – cooperatives and private banks
6. Diversification of non-farm activities
7. Introduction of crop insurance policy (weather based crop insurance system)
8. Development of seed banks
9. Public private partnership in provision of agriculture extension services
10. Convergence of existing rural and agriculture development schemes at ground level
11. Creation of massive employment generation through exiting National Rural Employment Guarantee Act/Schemes (NREGA) in all the dry districts of Gujarat
12. Development of a well network of information management system- through GIS (Geographical Information System) techniques

The above policy recommendations are suggestive in nature and likely to improve the existing drought mitigation approaches in the state

Annexure: VII - 1

Guidelines for Watershed Development

Based on the recommendations of the Technical Committee, comprehensive Guidelines for Watershed Development were issued in October 1994 that came into effect from 1.4.1995. These Guidelines were applicable to three main programmes, namely, Integrated Wastelands Development Programme (IWDP), Drought Prone Areas Programme (DPAP) and Desert Development Programme (DDP). The Government attached utmost importance for development of waste and degraded lands by increasing their productivity following the principle of equity, transparency and community empowerment by adopting low-cost locally available technology and material. These guidelines were in operation for a period of over six years.

Revised Guidelines

Keeping in view the feed back received from field studies, interaction with the NGOs, field functionaries all over the country and 73rd/74th amendments of the Constitution of India empowering the Panchayati Raj Institutions, these Guidelines were revised. The revised guidelines were issued in August, 2001 and the revised version offers a contemporary regime, some of the salient features of which are:-

- Revision of cost norm from Rs. 4000 per hectare to Rs. 6000 per hectare;
- A programme specific and focussed project approach with destinations, road maps and milestones;
- A probation period for new projects;
- Convergence of other programmes of the Ministry of Rural Development and Other Departments into the watershed areas;
- Greater role for Panchayati Raj Institutions especially the Gram Panchayats/Gram Sabhas;
- Effective use of remote sensing data in selection of watershed, formulation of action plans etc.
- Value added two way feedback from local institutions at District & State level in a new partnership mode;
- A twin-track approach in realizing short-term quick returns, along with long-term objectives to secure greater motivation;
- Establishing credit linkage with financial institutions; and
- An exit protocol for the Project Implementation Agencies.

The Revised Guidelines for Watershed Development issued on 30th August, 2001, envisage greater role for Panchayati Raj Institutions (PRIs), particularly Gram Panchayats and Self-Help Groups / User Groups in the implementation of watershed development projects. It has been provided that the Project Implementing Agencies should preferably be selected from amongst the PRIs. Further, it has been made

mandatory for the Secretary, Watershed Committee to provide all information in respect of action plan, funds earmarked for various activities, details of expenditure incurred, progress of work and future action plan to the Gram Panchayats/Gram Sabhas. The watershed action plan shall also form part of annual action plan of Gram Sabha.

Hariyali Guidelines

Under the new umbrella Guidelines “Hariyali” some amendments have been carried out giving more powers to Gram Sabha/Gram Panchayats. These guidelines have been made applicable to the new projects sanctioned from 1.4.2003. The execution of watershed projects is to be carried out by Gram Panchayat. The block level or Zilla Panchayat will act as a Project Implementing Agency (PIA). In case they do not have the expertise to implement the project, a line department of the Government or and NGO can be appointed as PIA. Funds will be released in five annual installments.

Programmes Strategy of Implementation

The programmes are to be implemented exclusively on watershed basis. In project mode, the area of which is 500 hectares. All activities relating to watershed development and management like planning, execution and maintenance of assets created are to be taken up by the local people through their own organizations specifically created for the purpose. Government agencies provide necessary financial and technical backup to the watershed communities. The thrust may be on common lands and livelihood opportunities to landless.

Activities for Watershed Development under DPAP & DDP

The DPAP & DDP emphasize on activities based on the methodology of low-cost and locally accessed technology. Accordingly, Land Development including in-situ soil and moisture conservation measures, Water Resource Development to increase land productivity, Afforestation for bio-mass production and Pasture Development to support livestock population are the broad categories of activities taken under the programme.

Besides, these programmes also include component for alternative livelihood creations for landless by organizing Self Help Groups (SHGs).

Cost, Funding Pattern and duration of the project

The prevailing cost for a prescribed watershed project of 500 ha. is Rs. 30.00 lakh i.e. Rs. 6,000 per hectare. Central and State Government in the ratio of 75:25 share the cost. 80% (85% in projects sanctioned under Hariyali) of the cost is devoted towards watershed development activities and rest 20% (15% for Hariyali projects) for community organization, training and administrative jobs. The central share is released in 7 installments (5 installments for Hariyali projects) by following a prescribed procedure. The project is to be completed over a period of five years.

Implementation

The implementation of DPAP and DDP watershed projects follow a well defined institutionalized mechanism to ensure people’s participation and community empowerment. The projects are implemented by **District Rural Development Agencies/Zilla Parishads** through Project Implementing Agencies (PIAs) that may be a Panchayati Raj Institution or a Line Department or a credible NGO in the same order of

priority. The **Watershed Association** comprising of local people through **Watershed Committee** does the planning and execution of unit project. The **Watershed Development Team** provides technical input in the process. Projects sanctioned under **Hariyali** with effect from 1.4.2003 are to be executed by Gram Panchayats with Block Panchayat / Zila Panchayat as PIA.

Monitoring instruments

There is a three tier monitoring system: at the **central level** through (a) Area Officer Scheme (b) through Performance Review Committee and (c) through Independent National Level Monitors (NLMs) and District Level Monitors (DLMs). State Watershed Development Committee and State Vigilance and Monitoring Committee periodically review the status and monitor progress of the programme at the **State level** and same is looked after by the District Watershed Development Committee at the **district level**. Social auditing by local stakeholders has also a vital role in monitoring. Recently, to monitor and supervise the projects at district level, The District Vigilance and Monitoring Committees under the Chairmanship of Local MP have been set up.

Project Evaluation

Project evaluation is undertaken in the mid-term and finally after the completion of the pprojects. The State Institute of Rural Development (SIRDs), autonomous / independent agencies and independent evaluators may be appointed by the State Governments for these evaluations. The Impact Assessment Studies are also conducted through independent agencies.

Impact Assessment Studies of DPAP & DDP Projects

In order to assess the impact of the DPAP and DDP projects, Impact Assessment studies have been carried out in programme States. These studies reveal that due to implementation of these watershed projects, the overall productivity of land has increased, water table has gone up and there has been a significant positive impact on overall economic development of the inhabitants in the project areas. The studies also indicate that green vegetative cover, irrigation, crop yield etc. have also improved in these areas. However, the studies underlined the need to address some important aspects like people participation, convergence, maintenance and equity sharing of assets, livelihood activities etc. to further strengthen the programmes.

Annexure: VII - 2

Process of Implementation: Drought Relief vs. DPP

Kutch Mahila Vikash Sangathan, Bhuj, Kutch, Gujarat

Process	Drought relief	Drought proofing programme
Conception/Prioritization of work	The Sarpanch and agewans of the village meet the TDO and provide information regarding possible worksites. The agewan moves from house to house to estimate the labour interested in relief work.	A committee of 12 persons including 5 women discusses the drought proofing work required and scientific inputs are provided by the supporting agency from Abhiyan
Design of structures	Engineers from Irrigation department or Civil works provide the designs and Taluka Panchayat makes the estimates.	Technical people from Abhiyan network provide the technical inputs and help the committee in making the estimates.
Approval of project works	Taluka Rahat Samiti makes the approvals, but Deputy Engineer has the right to veto non-productive works.	The support agency approves the proposed works and allocates the funds. (what about zonal committee?)
Administration of work sites	Talati prepares the list of able-bodied workers and gives it to the Muster carcoon, who takes the daily attendance.	The village Committee appoints two of its members, one male and another female to supervise the work. They are given daily allowance for this work.
Accounts and payments	Officers from Taluka Panchayat come and do the measurements and others from accounts come and make weekly payments. In reality sometimes payments get delayed by a month or even two months. There is no budget for the work, but if it appears that a particular work is not going to be finished, a new site is selected.	The money once approved is deposited in the account of the committee. The committee makes the payments after making the measurements and checking the quality of work. If the budget is exceeded, all payments are stopped until a fresh budget is allotted to the village.

Monitoring	Surprise checking is done by senior officers, organized by Gandhinagar. The collector also has his own team for checking of works. In case of corruption, people do not come forward to expose the culprits. However, corruption can be cured if the officers have the backing of the government.	Quality of work is checked by the technical persons of Abhiyan network. Accounts are openly discussed in meetings. In case of corruption people speak up and expose the culprit.
Punishment	The concerned officers are suspended and the site is closed for 21 days. The agewan rarely get any punishment, while the people suffer for this misdeeds	Punishment determined by collective wisdom of the community. Can use social ostracization as a form of punishment in extreme cases.
Dispute resolution	No mechanism exists. The one with the biggest horns gets the maximum benefits (“jena singra moto te wadhara labh lai jay”)	Village committee resorts to persuasion method to resolve disputes related to measurements and supervision etc. Taluka Sangathan can intervene if the dispute cannot be resolved by the village committee and the village elders. Help can also be sought from the support agency to facilitate negotiation/arbitration.
Transparency	Very little transparency either at the stage of planning or during implementation. Information on total amount spent at a work site is known as the money is disbursed in front of everyone.	Sharing and discussion of progress as well as accounts in the village meetings. People are aware of the amount spent on different structures, and of the proportion of benefits flowing of different sections of the village.

Source: Kutch Mahila Vikash Sangathan, 2004

Annexure: VII - 3

Present system of Monitoring of Watershed Projects

- The watershed approach has, in recent times, come to be recognized as the most favoured instrument of tackling poverty and backwardness.
- Presently, the projects are monitored by monthly / quarterly physical and financial reports. In addition, concurrent evaluation by Independent Evaluators or Field Visits by Area Officers or other officers of the Department is undertaken.
- At times, the Zilla Parishads / DRDAs, who are coordinating the implementation of these projects, are facing difficulties in formulation of detailed Action Plans either due to physical constraints or lack of infrastructure. At times, complete, timely and accurate information about the financial or physical achievements in respect of these projects is also not available. This creates difficulties in accountability, and leading also to disruption of the process of release of funds.

Proposed Supplementary Monitoring Apparatus

- To strengthen the monitoring apparatus at the District and State levels, the services of identified district-level and State-level Institutions will be utilized with whom a partnership relationship with District Authorities/State Department will be established. Institutes could be such as an ICAR Institute, Agricultural University / College, Krishi Vigyan Kendra, Farmers' Training Centre, NGO, Research / Academic Institution or quasi-Govt. Organization. These identified Institutions will assist in generating information / feedback based on 'observations' taken of the projects at prescribed points of time that stay-in-step with the natural rhythm of implementation. The Institutions will provide timely and precise inputs regarding the pace and the quality of the implementation of the project, on a permanent and dedicated basis.
- The proposed arrangements will serve the purpose of adding value to the monitoring system in force. The general idea is to supplement the efforts in place by instituting in-house mechanism that will be more in the nature of On-Line Real-Time Management Information System. The information about the watershed projects will be generated on regular basis.
- The above arrangement will be in addition to the traditional method of monitoring which are mainly intended to facilitate compliance-related requirements and will continue.
- The Institutions will act as Guide and Adviser to the District Authorities and also work as eyes and ears of the Government. The Institutions will spare the services of an officer (assisted by one or two ministerial staff) for performing the expected jobs, including identification of leading activity required in each of the watershed projects.

Selection of Institutions

- At the District level, the Institutions, having proximity to the project area, having necessary and adequate expertise and infrastructure, including manpower dealing with the watershed development programmes or the programmes of similar nature, will be associated. No new posts will be created for this work and the present manpower in the Institution will shoulder this responsibility with remuneration paid to them. If no such Institution is available, the Institution in a neighbouring district may be assigned the job. Reputed and established NGOs will be selected in deserving cases in the absence of government institutions.
- Similarly, State level Institutions will be identified to coordinate the working of these District-level Institutions. They will also visit at least one-third projects in the State, selected randomly, in a year.

Methodology of Selection

- State level Institutions will be selected by the State Government in consultation with State Watershed Committee with the approval of Department of Land Resources. Larger States may have more than one Institute with the prior approval of DoLR, if so required.
- District-level Institutes will be selected by the State Government on the recommendation of Zilla Parishads / DRDAs under intimation to Department of Land Resources.

Tenure of Institutes

- The Tenure of State/District level Institutions shall be valid for three years.
- The State Government may extend/limit/reduce/terminate their term without assigning any reason with prior approval of Department of Land Resources.

Funds payable to the Institutions

- The Institutions will be eligible for annual lump sum amounts for meeting the travelling and incidental expenditure of their officers, visiting the project area, at the following rates:-
 - a. District Institutions:
 - i. Rs.1.00 lakh annually where two IWDP projects or 50 watershed projects under DDP / DPAP of 500 ha. or a combined area up to 25,000 ha. under the projects is under implementation.
 - ii. Rs. 1.50 lakhs where 50 to 100 watersheds projects under DDP / DPAP or 4 IWDP projects or a combined area of 50,000 ha. is under implementation.

- iii. Rs.2.00 lakhs in the Districts having more than 100 watersheds projects under DDP, DPAP or 5 or more projects under IWDP or a combined area exceeding 1 lakh ha.
- b. The State level Institutions will be provided Rs.3 to 5 lakhs annually, depending upon the number of watershed projects under implementation in that State.
- The funds payable to the State/District Institutions will be paid in advance to the State Government who will release it to the SLI / DLI in two equal instalments, first on selection of the Institutes and the second after six months if the work is found satisfactory.

Observations to be made by DLI during project visits

- The DLI will visit the assigned project area in four phases of the lifecycle of the project and invariably record observations on the points mentioned below :-
 - Phase I: Awareness building phase :
 - i. Community Sensitization
 - ii. Entry Point Activities
 - iii. Training programme drawn
 - Phase II: Institution building phase :
 - i. Training arrangements
 - ii. Constitution of SHG / UG / WDT
 - iii. Formation of WA / WC / Appointment of Watershed Secretary / Volunteers / Registration
 - iv. Opening of bank accounts.
 - Phase III: Implementation phase:
 - i. Preparation and approval of Action Plan
 - ii. Progress of work and implementation of various activities as well as release of funds from DRDAs
 - iii. Exit Plan
 - iv. Watershed Development Fund collection
 - v. Other important features
 - Phase IV: Assessment of implementation :
 - i. Impact on major parameters – Fodder availability, plantation, outgoing migration, water table, productivity, area under multiple cropping.
 - ii. Usufruct sharing arrangement and other related issues

iii. Exit Protocol – arrangements in position.

Occasions for visit to project areas

- First Visit during the first phase will be made after registration of 50% of Watershed Associations have been formed or after six months of the sanction of the project, whichever is earlier.
- A visit will also be made after release of second instalment to the DRDA or after one year of the sanction of the project, whichever is earlier to make observation on the points for institution building phase-II.
- A visit will also be made every year during implementation phase-III after the end of active planting season.
- A visit will also be made during the fourth year of the implementation of the project, after end of every planting season during fourth phase to make an overall socio-economic assessment of the implementation of the project
- The points mentioned in each Phase in para 9.1 above are only illustrative and not exhaustive. Additions to these points may be made while reporting.

Reporting

- The DLI will send the Reports to the DRDA / Zilla Parishad / State Government as well as Department of Land Resources by E-mail or on-line as may be developed followed by report to the State Government in writing.
- The reporting will be on the points mentioned against Phases-I or as may be supplemented by the State Government/Department of Land Resources in due course or as added by DLI.
- The reports will be in the shape of objective reporting not on the point whether an activity had been performed but whether it had been done in a satisfactory/very satisfactory/unsatisfactory manner. For example, if in the phase-I, it is relating to formation of WA/WC, it should be reported whether the formation had been done without any opposition/objection from any quarters. The emphasis should be on the quality and not the performance of the activity itself. Similar approach is to be made on other points in all the phases.
- The SLI will consolidate the reports of the DLIs and send a report by e-mail followed by a report in writing.
- The DLI / SLI in addition to the objective reporting may also send exhaustive report especially for phase-IV in narrative forms.

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