CHAPTER - VII

PLANNING STRATEGY FOR THE INTEGRATED DEVELOPMENT
OF THE DISTRICT

Abstract of the Chapter:

Drought is the principal cause of socio-economic backwardness of the district. Thus, Government organisations, NGOs and the people have developed various development strategies to combat with drought. Various planning strategies are suggested to develop the available resources in a sustainable way for the overall development of the area.
CHAPTER - VII

PLANNING STRATEGY FOR THE INTEGRATED DEVELOPMENT OF THE DISTRICT

Large areas of Gujarat State are situated in the periphery of the southwest monsoon zone having an uncertain, scanty and erratic pattern of rainfall, which gives 90-95 percent of the total annual rainfall within four months of a year. Only little more than 36.60 percent of the total cultivated area of the district is having irrigation facility. In this case, we can say that nature determines the state of the economy as a whole. This chapter first focus on the work of Government, followed by NGOs (Non Government Organisations) and the work of the people. Later, an integrated planning strategy has been suggested for the management of drought for Banaskantha district.

A. GOVERNMENT ORGANISATION AS AN AGENT TO DEVELOP THE REGION:

1. Identification Of Drought Prone Areas Of The District By Government:

Scarcity or drought will occur not only within the identified hard core areas but also in areas with high rainfall, like south Bengal, Bihar and south Gujarat, therefore after the Independence of 1947 the central and the state governments have launched many programmes to mitigate the problem of drought in States. Hence, the prior objective laid by the government is to identify the severe drought prone areas of the State.

A number of committees have been set up from time to time for the identification of scarcity stricken and chronically drought prone areas of the State. The former Government of Bombay had appointed a committee in 1959 known as Fact Finding Committee to examine the economic conditions in all the areas of the State with a view to assesses the fact of recurrent famines and scarcity conditions.

The Fact Finding Committee has delimited the entire State into different areas and classified them into three categories:

1. **Category A**: The areas, suffered failure of crops once in three years, represent the areas of chronic scarcity.
2. **Category B**: The areas, which were seriously affected by scarcity once in six years.
3. **Category C**: The areas, which were affected only once in ten years.

Areas in which the frequency is less than once in ten years, have been considered as practically free from scarcity. Classification was mainly guided by the three factors, namely, rainfall, landuse and...
In 1968, Government of Gujarat set up the Scarcity Survey Committee to make a comprehensive survey of the scarcity situation in different parts of the State. The main objective of the committee was to identify vulnerable drought areas, major problems, which were affecting these areas and to suggest long-term measures to eliminate the problems. In addition to the factors taken to identify drought prone areas by the fact Finding Committee, the following factors were also considered by the committee to delimit the drought prone areas of the State:

i. Scarcity and semi-scarcity condition in the past.

ii. Rainfall and its variation.

iii. Subsequent developments in the fields of agriculture and irrigation facilities.

iv. Other factors, like nature of soil, cropping pattern etc., which has a bearing on the stability of agricultural production.

The Scarcity Survey Committee has classified 25 talukas as chronic scarcity affected area in the State, out of which four are in Banaskantha district.

Table No. VII. 1.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Category</th>
<th>Name of Taluka</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.</td>
<td>A</td>
<td>Radhanpur</td>
</tr>
<tr>
<td></td>
<td>(chronic scarcity areas)</td>
<td>Santalpur</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wav</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tharad</td>
</tr>
<tr>
<td>II.</td>
<td>B</td>
<td>Deodar (part of taluka on the west of Deodar town and north of Deesa-Kandla line).</td>
</tr>
<tr>
<td></td>
<td>(scarcity areas)</td>
<td>Dhanera (part of the taluka to the west of railway line).</td>
</tr>
</tbody>
</table>

Table No. VII.2.
List Of Talukas Classified As Chronic Scarcity Areas By The Scarcity Survey Committee, Government Of Gujarat, 1968

<table>
<thead>
<tr>
<th>District</th>
<th>Talukas</th>
<th>Areas (in sq. k.m.)</th>
<th>Population (1991)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radhanpur</td>
<td></td>
<td>595.70</td>
<td>94669</td>
</tr>
<tr>
<td>Santalpur</td>
<td></td>
<td>1351.60</td>
<td>86396</td>
</tr>
<tr>
<td>Wav</td>
<td></td>
<td>1701.20</td>
<td>159246</td>
</tr>
<tr>
<td>Tharad</td>
<td></td>
<td>1358.10</td>
<td>196289</td>
</tr>
<tr>
<td><strong>Banaskantha</strong></td>
<td></td>
<td><strong>5006.60</strong></td>
<td><strong>536600</strong></td>
</tr>
</tbody>
</table>


The Irrigation Commission has identified 60 talukas in 11 districts of Gujarat as drought prone areas of the State. These talukas have covered 35% of the total area of the State, 24% of the State population and 13% of the drought prone area of the country. On the basis of the annual and southwest monsoon rainfall data from 1901-1960 for 500 stations, the Irrigation Commission has identified drought areas and chronic drought areas. (Figure No.VII.1.) According to the Irrigation Commission following are the criteria for the division of areas:

1. **Drought Areas**: Areas, where drought had affected 20% of the years examined.
2. **Chronic Drought Areas**: Areas where drought has occurred in more than 40% of the years as, "chronic drought areas".

Table No. VII.3.
List Of Talukas In Banaskantha District Identified As Drought Prone Areas As Per Irrigation Commission Report, 1972

<table>
<thead>
<tr>
<th>District</th>
<th>Talukas</th>
<th>Area (in sq. k.m.)</th>
<th>Population (1991)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radhanpur</td>
<td></td>
<td>595.70</td>
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<td>1358.10</td>
<td>196289</td>
</tr>
<tr>
<td>Dhanera</td>
<td></td>
<td>1190.20</td>
<td>191633</td>
</tr>
<tr>
<td><strong>Banaskantha</strong></td>
<td></td>
<td><strong>6196.80</strong></td>
<td><strong>918310</strong></td>
</tr>
</tbody>
</table>


Government of India has identified 41 talukas of the Gujarat State under the 'Drought Prone Area Programme (DPAP)'. The talukas covered under DPAP constituted 28% of the total area and 18% of the total population of the State. Banaskantha District comprises of 6 talukas under DPAP and covers 13% of the area and 11% of the population of the district.
Due to a distortion in the pattern of Central/State financial relation for relief measures in drought affected areas, the Sixth Finance Commission has suggested the integration of normal plan and the scarcity relief operations in chronically drought prone areas. Accordingly the State Planning Board set up a working group to plan the drought prone areas. The main objective of the programme is to start labour intensive projects, i.e., minor irrigation, soil conservation, agro-industries including dairy, poultry, canning and infrastructure facilities along with operational aspects and the financial magnitude involved. Working group has identified 69 talukas of Gujarat State for preparation of the setting up of a Contingency Plan.

<table>
<thead>
<tr>
<th>District/State</th>
<th>Talukas</th>
<th>Area (in sq. kms.)</th>
<th>Population (1991)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banaskantha</td>
<td>1. Radhanpur</td>
<td>595.70</td>
<td>94669</td>
</tr>
<tr>
<td></td>
<td>2. Santalpur</td>
<td>1351.60</td>
<td>86396</td>
</tr>
<tr>
<td></td>
<td>3. Deodar</td>
<td>1012.02</td>
<td>190077</td>
</tr>
<tr>
<td></td>
<td>4. Wav</td>
<td>1701.20</td>
<td>159246</td>
</tr>
<tr>
<td></td>
<td>5. Tharad</td>
<td>1358.10</td>
<td>196289</td>
</tr>
<tr>
<td></td>
<td>6. Dhanera</td>
<td>11190.20</td>
<td>191633</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>7208.82</strong></td>
<td><strong>918310</strong></td>
</tr>
</tbody>
</table>

Drought Prone Talukas Of Banaskantha District Identified By Various Government Organisations

* Same talukas are identified as drought prone areas under the Contingency Plan, 1977

Whatever the Committees/Working groups have analysed to delimit the drought prone areas of Banaskantha district, four talukas viz., Wav, Santalpur, Radhanpur and Tharad are always decided as chronic drought prone areas. All these talukas are located in the vicinity of Rann of Kachchh. Some Committees have also considered Deodar and Dhanera as drought prone areas of the district. Drought prone areas delimited in the study in Chapter-III are based on the definition given by Irrigation department. The result drawn is equivalent to the drought prone areas given by other Committees.

A.2. **Performance By Government To Develop The District**:  

a. The economic backwardness of desert areas has encouraged the government to start Desert Development Programme in these areas. This programme is confined to four districts of India, viz. Mohindergarh in Haryana, Barmer and Jaisalmer in Rajasthan and Banaskantha in Gujarat.

The Desert Development Programme (D.D.P.) by District Rural Development Agency was launched in drought prone talukas of Banaskantha district in 1977-78. This programme is implemented in seven talukas of the district, which are Radhanpur, Santalpur, Wav, Dhanera, Tharad, Deodar and Kankrej. D.D.P. is conceived as a long-term measure for the restoration of ecological balance and optimum utilisation of land, water, livestock and human resources to mitigate the effect of drought from these areas. Major thrust of these programmes during the seventh plan was:

- Development of soil and method of moisture conservation
- Development of water resources
- Afforestation and development of pastureland
- Development of grasslands and of other fodder resources

Desert Development Programmes are being essentially an area development programmes which aim at optimum productivity of land, water, livestock and human resources. This is possible only if various activities are taken up in an integrated manner in a compact area, i.e., micro-water shed and catchment area in the desert. All the seven talukas covered under D.D.P. are located in the western part of the district, which is near Rann of Kachchh and Rajasthan. Total area of the selected watershed project is 38766.39 hectares, in which:
1. Private land -- 30251.06 hectares (78.03%)
2. Panchayat Land -- 4766.17 hectares (12.29%)
3. Government land -- 3749.16 hectares (9.67%)

Total -- 38766.39 hectares

Area already treated on or before 31.3.93 was 6191.76 hectares. Therefore area remained for
treatment after 31.3.93 was 32574.63 hectares (83% of the total watershed project). D.R.D.A. has
not published any report after 1993 of its progress, hence the area reclaimed after 1993 is not
known.

An annual action plan for the year 1992-93 for Desert Development Programme was of Rs.195.59
lakhs. Maximum expenditure kept in the total provision is of 58% for forest and pasture development
as they have given the highest weightage in this programme. Soil and moisture conservation project
have received 11%, water resource development got 10% and fodder development got 2% of the
allocation of funds.

Detailed study of the implementation of the programme by D.D.P. in different sectors:

i. Soil Conservation: Works going on under the land development and moisture conservation
programme are nala plugging, land shaping and terracing, contour bunding and farm pond.

ii. Minor Irrigation and Water Resource Development: Non D.D.P. talukas also suffer from scarcity
of water for irrigation because the area has a high slope and ephemeral type of river with sandy
beds. Different types of schemes are going on to conserve the water. But the type of schemes
differs from the eastern to the western part of the district. The method used to conserve irrigation
schemes are minor irrigation schemes, check dams and percolation tank

These schemes are also taken care of on Santalpur and Radhanpur taluka, which are drained by
Banas river. Irrigation schemes for non-D.D.P. talukas are sponsored by the Drought Prone Area
Programme (DPAP) and Irrigation Department of the district. D.D.P. is working on different
projects to conserve water in the western part of the district. They are percolation tank and Ad-
bund (It is a mud or concrete wall made between the Rann of Kachchh and cultivable land, which helps to stop the encroachment of desert from the Rann).

iii. Afforestation: Afforestation work covers Wav, Santalpur, Radhanpur, Tharad and Dhanera taluka of the district. The vicinity of the advancing Rann of Kachchh has affected 3600 sq. km area of these talukas. The massive tree plantation programme has been launched by D.D.P. in order to arrest the salinity and also for the creation of a green belt on the periphery of the agricultural land for protecting the crops from the desert winds. Other objectives of D.D.P. are to generate employment for unskilled agricultural labourers during summer and also to meet the local demand of fuel wood, fodder and small timber.

iv. Other programmes (Animal Husbandry and Dairy Development): D.D.P. has launched various programmes for the development of animal husbandry in a region. They are development of pastureland for fodder, establishment of veterinary hospitals and fodder camps, establishment of Banas Diary for the economic stability of the people and milk cooperatives are opened for the collection of milk from different villages and to supply it to the dairy.

D.D.P. has also put emphasis on efficient water management to utilize every drop of water for higher agricultural production. In this context, Gujarat State Rural Development Corporation (G.S.R.D.C) under D.D.P. has proposed various methods like drip irrigation method, development of horticulture and priority is also given to Sardar Sarover Yojana

3. Evaluation of government work in the district:

a) Achievements of Government Work:

i) Government has made 40 minor irrigation scheme, 5 lift irrigation scheme, 25 check dams, 123 percolation tank and 128 ad-bunds in the district till December 1997.

ii) D.D.P. has covered an area of 52410 hectares of forestland under afforestation programme.

iii) During 1993-94 afforestation work in D.D.P. area has generated 2717 mandays of work.

iv) Government has introduced many new methods for the conservation of soil and water like contour bunding, farm ponds nala plugging and drip irrigation.
b. Reasons for the failures of government work:

i) Desert Development Programmes (D.D.P.) follows a similar planning strategy for all drought prone areas of the country. The drought prone talukas within Banaskantha district have different socio-economic and ecological condition. Even the immediate problem of each village is different from each other. Therefore, centralised planning strategies for all drought prone talukas is not suitable for the success of the project.

ii) Failure to involve village people in design and maintenance of the project has resulted in the failure of many government projects. The ad-bund made during 1987 (drought year) in Lodhrani village of Wav taluka has failed because of excessive withdrawal of water from ad-bund.

iii) Most of the government achievements survive only till the completion of project period. Local people cooperate with the government agency during the project is for food, cash and employment. They are not trained to run the show after the government officials leave.

iv) Most of the project does not involve the weaker section of the village, e.g., women and landless labourers of the village.

v) Population of sheep and goats is very high in the district. But very less attention is given by the government to develop the breed of these animals and to save them during drought period.

vi) Land capability of the district is not adequate for the development of agriculture and other primary activities. But most of the government projects are based on the development of primary activities. Government has never given emphasis on the development of the other resources like small-scale industry. Development of other resources will be helpful for the economic stability of the district and also to decrease the seasonal and annual migration from the region in the long run.

vii) All programmes started by the government to increase the employment opportunities of the region are for very short period. When the project finishes, the situation of unemployment becomes same as before the project was developed in an area.

viii) Different types of development projects are going under Desert Development Programme (D.D.P.) which are implemented by various government agencies. But there is a communication gap between these agencies with the department. For example, the Forest department and the Irrigation Department are working independently in the same area in the same period for the development of soil and moisture conservation.
ix) Government has selected Prosopis Juliflora to stop the desertification as an afforestation programme, but it has affected adversely the water table and bio-diversity of the region and now it is costing 3.6 crores of rupees to deforest them.

B. DEVELOPMENT WORKS IN DROUGHT PRONE AREA BY NGO'S:
The Chief Minister announced on June 31, 1999 that the government has handed over nearly 2,500 villages to 20-odd voluntary agencies to implement poverty alleviation programmes out of the 3,600 declared Gokul Grams. As per the programme scheduled of “Gokul Gram Programme”, poverty alleviation is the second phase of programme. After the completion of provision of necessary infrastructure facilities including roads and community hall, 3,600 villages were declared as Gokul Gram in the first phase of the programme. (Times of India, July 1, 1999).

NGOs, unlike government officials, are helping to educate people to be self-employed at grass root levels. SEWA, the leading NGO, is working for the women’s development has prepared a pilot project for poverty alleviation in the five north Gujarat villages of the State. According to that infrastructure facilities provided under the Gokul Gram Programme by government remains unattended by rural poverty. This shows that the lack of interaction and without proper micro level studies the programme has failed in many places. While on the contrary, NGOs are working with village people. Therefore, these organisations are working better than government developed villages. Few major projects are managed by the Government. Government officials are not able to reach the grass root level as it is done by NGOs. People feel free to work under NGOs who have no barriers of interaction with people.

During the ninth five-year plan, District Rural Development Agency (DRDA) has emphasized the need to implement all development activities and water shed development through experienced NGOs. DRDA has recognized few organisations in the state for this challenging task, some of them working in the Banaskantha district are:
1. MGP Sarvodaya Kendra, Amrgadh
2. Self Employed Women Association (SEWA), Santalpur
3. Bhansali Trust, Radhanpur
The following are the description of work done by them:

B.1. MGP Sarvodaya Kendra, Amirdgh:
This organisation is working in 51 tribal villages of Palanpur taluka and 41 villages bordering Wav taluka. In these villages, the organisation is actively involved in the upliftment of socio-economic and educational activities. The organisation is running several tribal schools along with a rural college in Amirdgh tribal pocket. Since 1993, this organisation, through Sarvodaya Yojana Project has successfully worked in the field of wasteland development, low cost housing and women's craft development in the most remote villages of Wav taluka. People's participation at all levels is given the main focus of the entire watershed development project by the NGO.

Out of 41 villages in Wav taluka, 6 villages are selected for the watershed development project. The criteria kept for the selections of the villages are irregular monsoon, lack of water conservation systems, lack of drinking water facility, lack of employment opportunities and massive migration in search of employment and poverty due to above reasons. Based on these criteria's, villages selected are Lodhrani, Chatarpura, Golap-Nesada, Padan, Umedpura and Raghanesada.

Development through people's participation is a new concept. People who are illiterate and isolated from the mainstream have become cynical about the whole system. To get them out from such cynicism and create some faith, the project is intended to start with entry point activities. Following entry point works have been done in the beginning:

a) Construction of village wells for drinking and irrigation purpose.
b) Construction of small checkdams
c) Construction of rain water collection pump
d) Construction repairing of village tanks
e) Construction of toilets
f) House for widows
g) Construction of a one room school and distribution of notebooks and books in primary schools
h) Provision of play equipment's
i) Distribution of seeds
j) Running adult education classes in Chatarpura and Raghanesada
k) Road repairing
l) A chemical called Tikitar-Primer was supplied to women to save their house walls from high velocity of wind.

Major activities under watershed programme are:

a) Afforestation: Total 148000 saplings of trees were distributed to individual farmers. Total expenditure in six villages is Rs. 1.75 lakhs. The survival rate of saplings is 50.5%. This activity has checked the land erosion occurred due to wind and monsoon water.

b) Distribution of seed kits: During the crop year of 1997-98, the organisation has distributed improved seed kits to 1085 marginal farmers to increase the crop production in the area. Total expenditure incurred in this programme was 7 lakhs.

c) People’s contribution: Through the 10% compulsory contribution from user’s and self help groups, about 6.70 lakh rupees (expected) is deposited in the saving accounts of each village. This amount is planned to be converted into a corpus money and the interest from that money will be utilised for the developmental activities in future, even after the completion of watershed programme.

d) Improvement of cattle breeding: For the improvement in cattle breeding, improved varieties of bulls were provided to each village. These bulls were bought from Banni area of Kachchh by farmers themselves. This resulted into improvement in progeny of buffaloes with more yield of milk. This development has also revived the defunct milk co-operatives in Lodhrani and Umedpura villages.

e) Other development programmes by the organisation other than WSD Programme are:

i) Jeevandhara scheme (well construction): 16 new wells have been constructed under this scheme in 3 villages (Umedpura, Lodhrani and Raghanesada)
ii) DWACRA Group: DWACRA (Development of Women and Children in Rural Areas) activity has been taken up in two villages:

- **Umedpura**: The woman's group is engaged in cement brick making, earning approx. RS. 40,000. Besides, the group made a profit of RS. 20,000/-. 
- **Lodhrani**: The woman's group was engaged in selling agriculture produce and roof tiles under this scheme. They made a total profit of RS. 20,000/-. 

iii) Low cost housing: Total 107 small houses were constructed under Indira Awas Scheme for the poor by the Kendra in 15 villages of the Wav taluka. In a village like Raghanesada, for the first time after the Independence, 27 new houses were constructed only in a period of one year by Kendra. Earlier people were living in grass huts.

iv) Low Cost Sanitation: About 200 low cost toilets were made by the CAPART organisation to the Kendra, 56 toilets have already been constructed in 13 villages. The beneficiaries of this scheme mainly belong to backward communities of the villages. The total expenditure to this scheme till the end of 1997 was RS. 1,20,520/-. 

**B.2. Self Employed Women Association (SEWA) At Banaskantha:**

SEWA, is a trade union working for poor and self-employed women in urban and rural areas. SEWA strives to provide a worker producer status to self employed women through a joint struggle of union and cooperatives. On 1988, SEWA has launched a regional development programme in Gujarat. It has covered Radhanpur and Santalpur talukas of Banaskantha district on 1992 under this programme. The Government of Gujarat, under the Indo-Dutch bilateral programme, has launched the Santalpur Regional Water Supply Scheme (SRWSS). The programme aims at providing assured water supply, health, sanitation and income to the local communities through their active participation in its implementation, thereby improving the living and working conditions of the communities. SEWA is invited to get involved in the socio-economic development under this scheme. The main objective of the project is to provide employment to women, i.e., assured work and income, which would ensure better nutrition, shelter and social security and thereby stop migration of the communities.
To achieve this goal, SEWA has initiated income-generating activities based on available local skills and assets, for women who live below the poverty line. Around 43,500 women from 82 villages of Radhanpur and Santalpur talukas are now getting sustained work as well as employment opportunities.

Activities of SEWA under the scheme:

a) Women artisans’ support programme: Women in Banaskantha have a rich heritage of crafts (embroidery, patch work, beadwork, mirror work and leather items), based on these local talents SEWA has set up a craft development center at Radhanpur which provides training, design documentation, product development, supply of raw materials and marketing. For marketing its product Nationally and Internationally, an outlet called Banascraft was set up in Ahmedabad. Women artisans organised into a local group under a government programme called Development of Women and Children in Rural Area (DWACRA). Out of 42 persons managed DWACRA groups, 22 have achieved self-sufficiency.

b) Eco-regeneration programme (Nursery and Plantation): SEWA has also engaged women of this region to activities related to antidesertification. Under the training and technical input of Gujarat Agriculture University (GAU), around 300 landless women are engaged in raising 10 lakh fruit and non-fruit sapling annually. SEWA also trains them in plant grafting, which provides additional income to them. Some 350 acres of panchayat and wastelands have been afforested under an agro-forestry and silvipasture programme.

c) Dairying and fodder security system: Cattle breeding is the next major occupation in the region after agriculture. SEWA in coordination with Banas Dairy has revived 75 defunct primary milk cooperatives. The Radhanpur Chilling Centre, which had been closed for several years has also been revived. With the enthusiasm of SEWA six women’s cooperatives in villages have been registered.

d) Food Production of India has launched the Fodder Security System (FSS) to purchase and store fodder during the harvesting season and distributed during the lean summer months.
With the assistance of SEWA, a committee of representatives of local communities manages the purchase, storage, distribution and financial activities. Some 2,000 cattle heads from six villages are supported by the FSS. The migration rates from the six worst affected villages have come down by 60%.

e) **Salt Farming**: Salt farming is another major activity in the area involving around 10,000 people. Based on a study conducted by SEWA and FPI, SEWA has launched two major programmes for salt workers.
   i. In 1991, women salt producers' cooperative was set up. The average monthly income of a member is RS. 700.
   ii. Based on the recommendations of SEWA, the Government of Gujarat launched welfare schemes for the salt workers of the entire state - the first of its kind in the country, which includes mobile health unit, day care centre and creche, shelter for salt workers, worker's health unit and recreational programmes. The scheme became operational from March 1993.

f) **Saving and credit**: In December 1992, local saving and credit groups of women were formed with a monthly saving of RS. 10 each. Credit is given to female members mainly for agricultural activities, house repair and purchase of cattle, which will consequently increase the income of the family and improve the living conditions.

g) **Minor forests produce collection**: Gum is collected from the forests of Prosopis Juliflora (Ganda Baval) that grows wildly in the saline and desert land. Since 1991, SEWA has organised 2000 gum collectors from Santalpur taluka of the district. These groups are licensed for gum collection by the Gujarat State Forest Development Corporation (GSFDC). Women members have started getting RS. 10 per kg in the year 1991-92, an increase of RS. 6 to 8 per kg from GSFDC, which is the sole purchasing unit for all forest products. During 1992, the GSFDC had a record collection of 30,000 kgs of gum from Santalpur region. Due to lack of marketing skill GSFDC has faced loss in it and which consequently has affected the gum-collectors of the region. Now to fill up its loss GSFDC has lowered the purchase price of gum to 6 RS. per kg during 1994. SEWA is now negotiating with the government for the following plans:
Planning Strategy for the Integrated Development of the District

i. Denationalization of forest product, and allow the women's group to sell it in an open market.
ii. Improved tools and equipment should be provided.
iii. GSFDC must pay the gum collector in daily basis not by weekly basis, as gum-collectors survive on day to day basis.
iv. GSFDC should provide health care and child care facilities for the families of gum collectors, as they face many occupational health hazards.
v. Improved techniques of gum collection to be introduced for better production.
vi. Direct market linkages to the Minor Forest Produce collection groups should be provided for reasonable returns.

h). Water as a regenerative input: SEWA has mobilized local communities for water harvesting activities including pond lining to harvest rain water, cleaning of wells and canals and construction of minor irrigation structures.

i). Social security schemes: The social security scheme was launched in 1992 by SEWA, for financial protection for poor, self-employed women. The scheme is jointly administered by SEWA and SEWA bank, in cooperation with United India Insurance and LIC. With the yearly contribution of RS. 65, the women payee covers accidental death, natural death, illness and the loss of occupational tools and housing during disasters such as flood, fire, theft or riots. But the insurance does not cover loss by common sandstorms in Banaskantha or cyclones. SEWA has also provided free or subsidized medical service to its members.

SEWA has also launched a food security programme called Shake Packet which provides daily essential commodities in government rate to remote areas, as the food supply by Public Distribution Systems (PDS) and Fair Price Shops (FPS) is irregular and inadequate.

j). Banaskantha DWACRA Mahila SEWA Association: Banaskantha district DWACRA Mahila SEWA Association was registered on 22nd December 1992. The association aims to provide infrastructural support in the form of raw material, training, managerial input, credit, work space
and marketing input to individual DWACRA groups. SEWA has planned to support the association in building new groups and strengthening the existing groups.

B.3. Bhansali Trust, Radhanpur:
Bhansali trust is one of the most recognised organization working in Radhanpur taluka. Trust is well known in the area for its free medical treatment to the poor people. Organization has its own hospital, which gives free maternity and other facilities.

Santalpur and Radhanpur talukas are usually hit by malaria which break during the monsoon, at that time organization is a great help to the people. Trust is also providing medical facilities to villagers by reaching some of the remote areas of Wav and Santalpur talukas with their medical team. These villages are mainly occupied by periodic salt labourers.

Trust also looks after the basic education for children in surrounding areas. It is not easy to run school in many villages of Santalpur taluka, which is occupied by salt workers who move to Little Rann of Kachchh for nine months of the year. In this process, whole family has to migrate which disrupt the education of children. The trust is now trying to start informal type of schooling in Rann of Kachchh.

Along with watershed programme, the Trust has also tried some of the water conservation method. Organisation has made three underground dams on Banas river in Radhanpur taluka but due to obligations from the other villages, they stopped the project. The Trust is also working with Khadi Gramodhyog of State government. They give cotton to the weavers and collect the output from them and sell this output to khadi Gramodhyog. In this way, they are providing employment to many landless people of the taluka.

There are also some other small organisations, which are working in the district like Awaj, Chetna, Seeds etc. These organisations are working for the development of different aspects.
B.4. Evaluation Of Works By NGOs:

There is no doubt that the NGOs are working hard with government to develop the drought affected backward districts of the state. These NGOs are coming up with some fascinating results:

a) NGOs have increased the employment opportunities in the area, which has helped in stopping seasonal migration from the area.

b) Increased employment opportunities have decreased the number of people living under poverty line.

c) Training camps by MGP Watershed Project has helped in improving the agriculture and its techniques.

d) NGOs have provided many important amenities like water, toilets, houses, road, schools and medical facility to many villages.

e) MGP Watershed Programmes and SEWA have achieved success in afforestation programme in different villages.

f) SEWA has given emphasis on the development of women population in villages. It has provided employment by giving them a market for their crafts and engaging them in agro-forestry and silvipasture.

g) Development of pastureland and financial assistance to rearers has improved the condition of animal husbandry in villages.

h) With the recommendations of SEWA, Government of Gujarat has launched welfare schemes for the salt workers of state.

i) Poor farmers from each village are relieved from the age old clutches of private money lenders as saving and credit bank for each village is opened to give loans to members.

a. Causes of achievements of NGOs:

i) NGOs are working with people therefore they can understand their basic problems. They are settling their programme as per the need of a village. In this way, NGOs are working from a grass root level in the development programmes.

ii) Participatory approach of NGOs in development projects has helped villagers to understand their problems and to use techniques to deal with them. In this way, people can continue the development process after the completion of project also.
iii) People's participation has resolved the problem of untouchability, community disputes and other
discriminations. People are working unitedly for the development work of village.
iv) NGOs are helping people to understand the importance of resources in their area and maintain
them properly.
v) Villages selected by NGOs for development programme are showing signs of development not
only in economic sale but also in social aspects of village like education.
vi) NGOs have helped to stop the seasonal migration from villages by creating employment for
people in their own village.

b. Besides these positive factors NGOs have some drawbacks also:
i) Very few NGOs are working in the district and they have selected very few villages for
development. Hence, the impact of their work is not enough.
ii) Every NGO is working as a separate entity and looking at only one aspect for development. Like
SEWA is working to develop the women's condition in an area and ignoring all other factors,
which should be included for the overall development of an area. MGP Sarvodaya Kendra is
mainly focusing on watershed development project ignoring weaker sections of the village.
Bhansali trust is looking only after the health and education problem of the selected villages.

C. PEOPLE'S METHOD TO COMBAT DROUGHT
Water is an ephemeral resource for the people of arid and semi-arid areas. Only during the
monsoon, supply of water is more than demand in some talukas. After that, water is not enough to
meet the demand of the area, consequently the land becomes dry and water become scarce in the
area. These causes made the people of the region to preserve water for dry seasons by different
water harvesting methods.

In dry areas, the principal objective to store water is to meet the demand of household during
summers. But the storage is also done to irrigate rabi crops wherever it is possible. Different
traditional methods are used to store the water for dry periods of the year in different dry regions of
the country having the similar physical characteristic like Banaskantha district.
### Traditional Water Harvesting System Of Arid And Semi-Arid Regions

<table>
<thead>
<tr>
<th>Systems For Agriculture</th>
<th>Systems For Drinking Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Unlimited land in arid areas is used to collect water by developing rainwater-harvesting structures called <strong>kundis</strong>. Kundis are artificial wells which store runoff from an artificially prepared catchment surrounding the well, so that any rainwater that falls on the catchment, rapidly runs into the well and gets stored. Kundis are common in the Thar desert of Rajasthan.</td>
<td>1. Rooftop is used as a catchment area to collect rainwater (e.g., tanks of Pali, Rajasthan).</td>
</tr>
<tr>
<td>2. Tanks were also one of the major sources of water in Gujarat. As the geographical condition of the State has led to the building of numerous tanks, it is possible to find a tank or two in every village and town. Tanks are used for drinking and irrigation purpose.</td>
<td>2. Maldharis of Kachchh know that the density of sweet water is less than that of saline water. Hence, it is theoretically possible to keep the harvested sweet rainwater stored in a way that sweet water will continue to float on the denser saline water and thus providing an opportunity to live in this hostile climate. This kind of storing system is known as <strong>virdhas</strong>, which are located in the riverbeds, lakes and on the periphery areas of the desert.</td>
</tr>
<tr>
<td>3. Kund is a small depression with stepped sides with its central position sunk deeper in the form of a well. Kunds are usually made for agricultural purpose during rabi season.</td>
<td>3. Groundwater harvesting structure like stepwells are found all over northern Gujarat and Rajasthan. Stepwell is a long stepped corridor leading down five to six storeys to well at the far end. Water of a stepwell is rich in minerals, salts and other substances dissolved in it. Stepwells were mainly used for irrigation and social gathering during summers. It also serves travelers on their route by providing water and cool resting-place.</td>
</tr>
</tbody>
</table>

Source: *Dying Wisdom, Anil Aggarwal and Sunita Narain.*

Districts headquarter of Banaskantha, i.e., Palanpur has a large tank called Mansarover, which goes totally dry in summer but it is filled up during the rains. There is also a stepwell known as Mithi Vav. It totally dries up due to the lowering of the water table. There are also many dugwells in the town.

Villages, from the east to the west, manage water for agricultural and drinking purposes on their own way. Eastern parts of the district have adequate water for drinking purpose in dry season and also
have enough water to irrigate rabi crops. But due to high slope water does not accumulate on the ground. In Khuniya village of Palanpur taluka, tribal families irrigate their crop during rabi season by wells, which are located in higher attititudes. Water is pumped out from wells and through pipes' fields is irrigated which are located on the lower attitude. As the land is irregular in the region, they use branches of trees and bamboo's for free flow of water through pipes (Figure No. VII.2)

During continuous drought year from 1985-88, farmers of Kakwada village in Palanpur taluka have made a well on the Banas riverbed to save their crops. Many farmers are also using the riverbed of Banas to grow crops like tomato, melon etc. during summer season. Most of the villages in Santalpur and Wav taluka get the drinking water facility in dry season through government tanks or by pipelines. People sometime use camel cart to bring barrels of water from nearest town. People of western part of the district store fodder for dry season. During monsoon and winter season farmers or cattle rearers leave the cattle free and let them manage their own food. A common drinking water tank is made in every village for cattle. System of storing fodder for cattle is completely lacking in the eastern part of the district. Most of the villages depend on the nearest forest for fodder and also use crop hay.

Lack of maintenance has caused the vanishing of most of the traditional method of water storage and lack of interaction with outer world has restricted the adaptability of new technologies. Deficiency of water sources has resulted in the dependence of villages to water tanks supplied by government. Proper management practices of storing water and conservation of land by people's participation can make the area self-sufficient where water is concerned. Even with simple skills and discipline, rather than complex and expensive techniques, of the traditional method of soil and water conservation can be revived.

Objective number seven is completed here, as the planning strategies adopted by the government organisation, non-government organisation and people to combat drought and backwardness is evaluated. Based on these facts, planning strategies are suggested for the overall development of the area.
Schematic Diagram Of The Distribution Method Of Water Used By Tribals Of Khuniya Village To Irrigate The Irregular Land

Land to irrigate

Higher part

Higher part

Lower part

Source: Developed by the author
D. SUGGESTED PLANNING STRATEGIES FOR AN INTEGRATED MANAGEMENT OF A DROUGHT PRONE AREA

Management of drought is not just related to the water harvesting activities but there are enormous scopes of managing the impact of drought indirectly. In general, the impact of drought is maximum on agricultural and livestock products. Therefore, there is a need to develop resources other than agricultural products, to minimise the effect of drought. Other than this, organisation of people, trained with appropriate technology and participation of the villagers at a grass-root level, should be included in the management.

The main objective of any planning strategy, is the development of a region, which can be achieved through the organisation of society. It is not a simple task, as Indian society is highly segregated by caste and religion, hence activities of a community vary as per the desire of the society. Therefore, instead of changing the social pattern in a day, which leads to human clashes, it is better to proceed as per the social division in a humanitarian way. Somewhere all the communities can work jointly and somewhere progress can be made by the segregation of the community. Centralised approach for the development of whole district cannot pay attention to the various socio-economic and ecological factors prevailing in a region. Hence, a decentralised planning according to the need of a village is in the interest of efficient utilization of resources.

During drought, Government have no other options other than to start short-term programmes to give water and economic stability to support the minimum need of the people (by giving employment in relief camps). Drought leads to huge scale of migration from drought affected area to city or green areas. The long-term project to alleviate or to minimise the effect of drought in future can be started during drought period or summer season (in western parts where seasonal migration can be seen). Relief programmes, which are started by government or NGOs should be based on objective of land and water resource development of the region. Different types of land, water and other available strategies for resource management are suggested below to alleviate the problem of drought and its effect. These strategies should be carried out by Government agencies, NGOs, village panchayats and villagers themselves, according to the need of the region depending on the availability of finance and labour.
D.1. Management Of Water Resources:

In India, where water is an ephemeral resource, people have grown the extraordinary traditions of water harvesting in myriad forms. Various conservation methods are developed to conserve each drop of water from the moment it reaches the soil or vegetation. In a semi-arid region like Banaskantha, rainwater-harvesting method includes the conservation of excess water during wet period for dry season of the year.

a. Suggestions for the Government Organisation for the development of water resources:

i. **Underground anicut**: An underground anicut envisages excavation of trench in drought prone area along the Rann of Kachchh upto water level or it should be atleast 15 to 20m deep. The down stream wall and bottom of the trench are made impervious by providing polythene sheets and the entire excavated structure is filled with pervious sand. Such underground anicut will not only allow rainwater to harness for recharge and block water before it flows to Rann but also recharges the upper areas. (Figure No. VII.3.)

![Schematic Diagram Of An Underground Anicut](source: Developed by the author)

ii. **Diversion of Stream**: In arid and semi-arid regions where water in the streams is more seasonal and scarcer round the year, the water of stream is directed into a storage structure through
diversion channel. This water is used for human and animal consumption, and for agriculture during dry season. This method should be encouraged in all the villages, which are located on the bank of river.

iii. Development of water resources with the help of hydrogeomorphological map: Ground water occurrence is influenced by climate, physiography, drainage and geology of the area. Since the availability of ground water depends on the subsurface phenomenon, its identification and location are based on indirect analysis of some directly observable terrain features. Satellite remote sensing provides an opportunity for better observation and more systematic analysis of various geomorphic units and lineament features (which is already discussed in Third chapter) following the synoptic multi-spectral repetitive coverage of the terrain. With the help of geomorphic units, Space Applications Center, Ahmedabad, has prepared a hydrogeomorphological map of the district. This map provides the information on groundwater prospects with the help of litho-stratigraphy, structure and lithographic description, which will further help to suggest the planning strategy for the development of natural water resources.

As the remote sensing data is unable to provide information on quality of water and depth of aquifer, therefore more detailed hydrogeological/geophysical work is needed, especially towards the western part of the district, which have very poor quality of water resources and high water table. (Also refer the Figure No.III.7. to know the water prospects of the district)

<table>
<thead>
<tr>
<th>MAP SYMBOL</th>
<th>GEOMORPHIC UNIT</th>
<th>LITHOSTRATIGRAPHY</th>
<th>STRUCTURE</th>
<th>DESCRIPTION</th>
<th>GROUNDWATER PROSPECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF</td>
<td>salt flat</td>
<td>comprise fine grained material like salt</td>
<td>____</td>
<td>thin veneer of salt mixed with clay, gently sloping, barren</td>
<td>saline</td>
</tr>
<tr>
<td>FP</td>
<td>flood plain</td>
<td>composed of unconsolidated material like sand, gravel, pebble, boulders, clay and silt</td>
<td>____</td>
<td>relatively smooth land adjacent to river channels, constructed by present rivers and covered with water when rivers overflow their banks, gentle slope, normally cultivated</td>
<td>excellent, subject to water level and thickness of material.</td>
</tr>
<tr>
<td>Area</td>
<td>Description</td>
<td>Characteristics</td>
<td>Land Use</td>
<td>Comments</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>-----------------</td>
<td>---------</td>
<td>----------</td>
<td></td>
</tr>
<tr>
<td>VF</td>
<td>Valley fills</td>
<td>Constitutes boulders, cobbles, pebbles, gravels, sand, silt, clay etc.</td>
<td>The valleys are normally fracture controlled</td>
<td>Unconsolidated sediment deposited so as to fill or partly fill a valley, more thickness at the centre and tapering at the periphery, normally cultivated</td>
<td>Good to very good subject to depth of the filled material</td>
</tr>
<tr>
<td></td>
<td>Paleo channels</td>
<td>Mainly composed of sand and gravel</td>
<td></td>
<td>Old fluvial channels includes buried as well as abandoned channels, normally cultivated, gently sloping</td>
<td>Excellent</td>
</tr>
<tr>
<td></td>
<td>Vegetation anomaly</td>
<td></td>
<td></td>
<td>Unseasonal vegetation indicates the presence of loose material and good quality water.</td>
<td>Good</td>
</tr>
<tr>
<td>AP</td>
<td>Alluvial plain</td>
<td>Constitutes gravel sand silt and clay of varying lithology</td>
<td></td>
<td>Level or gently sloping tract produced by deposition of alluvium.</td>
<td>Excellent</td>
</tr>
<tr>
<td></td>
<td>Sandy plain</td>
<td>Composed of sand</td>
<td></td>
<td>Gently sloping, undulating, normally barren except few patches, influences recharge</td>
<td>Moderate to poor</td>
</tr>
<tr>
<td></td>
<td>Sand dunes</td>
<td>Composed of coarse to fine grained sand</td>
<td></td>
<td>Low mounds, comprising loose wind blown sand either bare or covered with xerophytic vegetation.</td>
<td>Poor to negligible</td>
</tr>
<tr>
<td>P(S)</td>
<td>Pediplain (sedimentary)</td>
<td>Mainly comprises of Jurassic cretaceous sediments. Composed of sandstone, shale etc.</td>
<td>Criss-crossed by fractures</td>
<td>Broad, gently sloping rock floor, erosional surface of low relief covered with thin veneer or detritus, sparsely vegetated.</td>
<td>Good</td>
</tr>
<tr>
<td>PZ</td>
<td>Piedmont zone</td>
<td>Composed of weathered, unconsolidated, medium to coarse grained material</td>
<td></td>
<td>Formed at the foothill zones by the coalescence or several alluvial fans, gentle slopes. Generally vegetated.</td>
<td>Moderate to good</td>
</tr>
<tr>
<td>IV</td>
<td>Intermontane valley</td>
<td>Constitutes colluvial / fluvial deposits of varying grain size</td>
<td>Sometimes fracture controlled</td>
<td>Depression between mountains. Generally broad and linear filled with colluvial deposits.</td>
<td>Good, depending upon thickness of unconsolidated material</td>
</tr>
<tr>
<td>DH(G)</td>
<td>Dissected hills</td>
<td>Comprises of highly jointed</td>
<td>High relief, steep slopes,</td>
<td>Negligable, moderate</td>
<td></td>
</tr>
</tbody>
</table>
v. Reclamation of Old Structures: Gujarat is today dotted with ruins of stepwells and stepped tanks. Many tanks have completely dried up, and in some places, they have been converted into open playgrounds. Due to lowering of the water table, stepwells are also dried up and filled with garbage. By reclaiming these old structures, water problem of the area can be overcome to some extent.

vi. Watershed Management: Watershed is the land surface from which water flows to a water course, the limits of such areas are described as watershed boundaries. All watershed contains many kinds of natural resources, i.e., soil, water, forest, wildlife, minerals etc. The hydrologic response of a watershed integrates the effect of several complex processes through its interaction involves land with soil features, climate, vegetation characteristics and management changes. The country is divided into many watershed areas by Irrigation Department. The watershed area of the district (Figure No.VII.4.) should be divided into micro and mini watershed, depending upon the slope and flow of the water, for the village level water harvesting planning. The watershed management involves decision making about use of available resources for many purposes and therefore, a multidisciplinary approach is essential.

The drainage routes ignore the boundaries of individual properties and serve the valley as a whole, hence, co-operation of all of the farmers' living near upstream and downstream of watershed is essential for the success of water harvesting system. The method of water management also changes in upper parts to lower parts of the stream. As the principal problem of upstream is high rate of erosion due to high slope whereas on downstream the problem is flood during monsoon and unavailability of water (sometimes due to excessive usage of water in upstream donot allow the water to reach the downstream). Sometimes, situation is reverse. If water is not checked in the upstream, the run-off will be high there, leading to shortage of water. The run-off water will be then collected in the lower half of the slope, where water is available. Hence an integrated programme of watershed management is required, where water is distributed in both in upper and lower slope of the watershed.
b. For village panchayat or NGOs:

i. **Construction of Check-dam**: Check-dams or Johads are basically an embankment used to arrest rainwater during the monsoon season. Normally, the check dam in the drainage courses of narrow streams is designed to be masonry. The height of the check dam is generally half of the height of the bank or if the bank height is considerable, the dam height can be designed in such a way that flood water does not spill over the bank during high floods. Check-dams are helpful to arrest rainwater and to improve groundwater infiltration, which consequently lead to recharging of dry wells. The "johad bed" can be used to cultivate crops during summer season.

*Figure No. VII. 5.*

**Schematic Diagram Of A Check Dam**

**Plan - View**

**Sectional View**

*Source: K.C.B.Raju, Strategies to protect the dwindling domestic supply in Kachchh District*
Construction of Virdhas: This traditional water harvesting system is practiced in low lying areas with low ground water table, which is salty, by the nomadic tribe (Maldharis) of the Banni grasslands in the desert areas of northern Kachchh district of Gujarat. Virdhas are shallow wells, dug out in low depression called "jheels". These are surrounded by Prosophis Juliflores trees and native grasses in the periphery to check soil erosion and siltation. Infiltrated rainwater accumulated through many small channels get collected at a level above the salty ground water because of its low density. To harvest the upper sweet water, many virdhas are dug in the upper layer of accumulated rainwater upto a depth of 1 meter above the ground water. There exists a transitional zone of brackish water between these two layers of sweet and saline waters. As the fresh water is removed, the brackish water moves upwards and accumulated towards the bottom of the well. Near virdhas, small clay troughs are made to provide drinking water for cattle.

Harvesting potential of tanks: In a semi-arid region, where rainwater is the only source of freshwater, every village should have a kundi with a catchment area according to the population and total mean rainfall. Let us take the Lodhrani village of Wav taluka, where the average rainfall is approximately 400 mm. and the total population of the village is 908 persons. Let us assume
that a person uses 2 liters of water in a day. The total annual demand of a Lodhrani village will, thus, be 0.662840 million liters. Now if the entire 400 mm of annual rainwater could be harvested, all that is needed a kundi, which has a catchment of 0.16571 hectare. Even if we assume that the efficiency of collection of rainwater is only 50 per cent of the annual rainfall, a kundi with a catchment of 0.33142 hectares will meet demand for the drinking water demand of the village. As land is not a critical limitation in Lodhrani, village can easily find much more than 0.33142 hectares to harvest rainwater in the dry season.

iv **Anicut** : An anicut is a structure that intercepts the water from local catchment and stores it for optimum utilisation. The retained water behind the structure can be used for lift irrigation and as drinking water for human, cattle and wild animals. The anicuts recharge the downstream wells and also prevent the saline ingress from Rann. An optimum utilization of water is required from the anicut, otherwise excessive lift of water can bring the salt water to ground.

v **Percolation tank** : Percolation tanks are constructed for impounding surface run-off to create small storage and for inducing recharge to groundwater through percolation. These tanks are very useful as means of water conservation and to strengthen the drinking water/irrigation water sources.

vi **Roaded Catchments** : In area, where rainfall is meager, surface slopes are negligible, soils are saline and construction of conventional water harvesting structures do not appear to be feasible, for such areas, roaded catchment has been considered to be technically possible. Roaded catchment consists of series of parallel formed and compacted roads with exaggerated camber that adjoin to make approximately V-shaped channels which discharge into a collecting drain at their lower end. Cambered steep road surface is made as smooth and impervious as possible. Drains between the roads are on grades that permit water to reach the storage structure expeditiously with minimum erosion. The site should consist of clay soil or clay sub-soil within 1m of the surface. Also the surface slope that allows the catchment drains to be aligned to correct grade. Road side slope is made as steep as possible in the range of 10 to 25%.
viitanka: In many parts of the desert, rainwater continues to be the only source of domestic water supply. Sandy soil of an area leads to acute shortage of water resources during summer. Thus, tanka, a rainwater harvesting system was developed by people several centuries ago in Gujarat and Rajasthan. Rainwater falls from the sloping roofs of houses and is conveyed through a pipe into an underground tanka. It is built in the courtyard of the main house. The tanka wells are plastered with cement or lime. Tanka is washed and cleaned before the onset of rains. The first spell of rainwater is not collected, as this would clean the roof and pipes while subsequent rains are collected and used judiciously.

Figure No. VII.7.

Source: Traditional Water Harvesting Systems, CEE

viii Roof water harvesting: Roofs for collecting water, should be made of aluminum sheet, ferrocement, plaster, flat roof (tiled top or cement concrete surface), wood and thatch (covered with plastic sheet). Roofs made of asbestos, bituminous sheets or sheets painted with lead based paints should be avoided as they can contaminate the water. The main advantage of
collection of rainwater from the roof is that it eliminates additional investment on construction of a catchment area and minimizes contamination with local matter or animal droppings.

Figure No. VII.8.

Schematic Diagram Of A Rainwater Harvesting System From Roof

Source: Ground Water Resource Development Corporation, Gandhinagar

ix Kund: In a drought prone area of the district; where rain is scanty and erratic, soil is sandy and salt affected groundwater is limited and salty to taste and no other source of surface water is pertaining; kund should be adopted. Kunds are a huge saucer structure, built of concrete and are found in Bikaner and Jaisalmer district of Rajasthan. It is an underground tank covered with a dome at the center. Underground tank is roughly 6 meter deep and 25 meter in diameter. The sides of the tank are plastered with lime and ash. The circular catchment is as large as 100 sq.km. with a smooth slope of 3 to 4% towards the tank. Water is drawn using buckets through an opening at the top of the dome. The opening is always kept closed when not in use. Kund is cleaned every year before the onset of monsoon. Cattle grazing and entry with shoes into the catchment area of the kund is strictly prohibited.136 (Figure No.VII.9.)
The rainwater harvesting structures are site and location specific. Hence, general guidelines are to be modified as per the need for each structure, before suggesting any rain water harvesting system. Selection of a particular type of structure is based on all those factors that affect runoff (rainfall and catchment characteristic), water need and economy of the region.

**D.2. Sustainable Agricultural Practices In Dry Lands**

Most part of the semi-arid part of the district is still to be under rainfed conditions. Current yield is low and production is unstable because of aberrant weather and poor management of soil-fertility and rain-water in these parts. There is a need to develop the production but with the constrain that technology or practice adopted, will not continue to deteriorate the land capability. Therefore a sustainable technology should be adopted, which will not only develop the per unit yield but also maintain the land capability in a long run.
Planning Strategy for the Integrated Development of the District

a. **Suggestion for the Government**:

i. Maximum numbers of farmers in our country are economically backward, therefore government should provide loan or subsidy in different agronomic practices, like Gujarat Government has provided subsidy in land leveling and ad-bund work to the farmers.

b. **Planning strategy should be adopted by the farmer**:

i. Dry farming methods including conservation technology should be popularized to conserve as much natural moisture as possible, in water scarce areas. According to Dr. Swaminathan the chief features of this technology are:

- Depending upon the soil type a suitable tillage and moisture conservation technology have to be introduced. Like, deep ploughing in some cases and minimum cultivation in others. Sowing of kharif crops in ridges will capture the moisture in furrows for the rabi crops.
- To develop a crop variety that grows quickly after sowing. If such grains are developed, two crops can be grown in the place of a single crop of long duration, even in climatologically bad years.
- To give more nutrition to the plant, i.e., to yield one ton of grains the wheat plant requires about 25 milligrams of nitrogen. Pulses and groundnuts can make their own nitrogen through *biological nitrogen fixation* in dry areas. Therefore, pulses and groundnut production should be emphasised in these areas.
- To develop new techniques of fertilization, which includes foliar spraying, adoption of plant protection measures with necessary infrastructure, demonstration and training.

ii. To ensure the optimum use of soil moisture, it is necessary to choose crops, which have deep root systems and have the capacity for quickly establishing roots in deeper layers of soil, but where water level is high like in Wav and Santalpur short rooted crop should be grown.

iii. Crops like Jawar and Pearl millet should be cut leaving some stem part, so the erosion will be less.

iv. Soil should not be ploughed before rainfall, otherwise it will be outwashed with rain water.
v. Double crop should be encouraged in a dry region so that if one crop is spoiled due to lack of water or diseases, farmer can sustain on the next crop.

vi. Crop should be sown in a line, perpendicular to slope so that erosion should be less and moisture quantity of the land will also increase.

vii. Tying of ridges: With the adaptation of modern tillage equipment, it is possible to drag the loose soils between the ridges into small dams or 'ties' to form rectangular troughs which hold the rain until it has time to soak in.

viii. Pearl millet and Sorghum is good for dry areas like Banaskantha district but it increases the rate of erosion. Whereas groundnut and pulses spread on a ground, so it helps to reduce the rate of evaporation and also erosion, therefore mix cropping should be encouraged, i.e., Pearl millet with groundnut.

ix. Land should not be evacuated even during summer season, as empty land allows high rate of moisture loss from soil. Land should be covered with left over of crops, so that land should not be directly hit by scorchy sun. Leftover crops should be mulched with soil to increase its fertility.

x. Hybrid/high yielding varieties of crops should be grown. Variety of crop that needs minimum period for its growth, less irrigation and gives comparatively better yield should be selected.

xi. Green manuring should be practiced, as there are many legumes that can grow in any type of climate and good for improving the quality of alkaline and saline soil. Green manuring legume is grown and buried, while it is green, in the soil to improve the soil productivity. Green manure not only provides nutrients to crops but also for buffering action of soils, for improving the structural status of the soil, preventing soil erosion and decreasing the incidence of plant diseases.

xii. It is a known factor that chemical fertilizer is not suitable for land, where water is not enough to wash out the chemical particles of fertilizer. Chemical particles donot mix up with soil and if it is...
not washed out properly by enough water, the excessive chemical particle will burn the crops and will not allow any agronomic practices after long period. Therefore it is feasible for farmers to minimize the use of chemical fertilizer by adopting proper natural way to increase the fertility of soil.

D.3. Soil And Moisture Conservation:

Soil and moisture conservation methods are the principal factor to improve the productivity of land. Due to scarce vegetation and loose composition of soil the rate of erosion is high and the moisture retention capacity of soil is very low, both in hilly eastern part and sandy western part of the district. There are various methods to conserve the soil, which should be adopted to increase the productivity.

a. For village panchayat or NGOs:
   i. Shelter belts: Shelter belt is a big bund protecting agricultural land from the desert. In this way it helps to stop the intrusion of Rann in culturable land. Massive afforestation on the shelter belts could check the erosion of the belt.

   ii. Maintenance and repair of old bunds: During the continuous drought year of 1984-87, government has made a shelter belt covering all the villages near Rann to give employment to ill-fated farmers and also to protect the arable land from further deterioration by Rann. After the drought period, neither the government nor the people have cared about the bunds and in due course of time it is eroded and broken by the strong wind. Therefore it is necessary to maintain and repair bund which is safeguarding the arable land from Rann by government as well as by villagers.

   iii. Nallah Plugging: Nallah plugging is a technique through which the natural flow of water during monsoon is diverted by constructing small drains to different direction, not allowing the water to flow towards Rann or river and helping to conserve the water.
iv. **Development of Khadin**: Khadin is practiced in Rajasthan where run-off water from the high catchment area is arrested in a field by a bund and leaves the water standing until the planting date for the crop approaches. Bund is about 100-300m in length and 1.5 to 3.5m in height. A spill-way is made at proper location to let out excess water. An outlet is also provided at the lowest point to facilitate removal of excessive water from Khadin before sowing time. The water discharged is often trapped by a second khadin in down slope and so on. The khadin soils remain wet and moist for a long time and progressively gets enriched with fresh fertile soil deposition, relatively high organic nutrient contents than the other arid soils. It not only preserves the soil moisture for the crops, but through infiltration the water table beyond the bund, recharge's wells in down slope which are important source of drinking water for human beings as well as for livestock's. This type of soil and moisture conservation method should be practiced in semi-arid areas of district also.

![Schematic Diagram Of A Khadin](image)

**Source**: Traditional Water Harvesting System

v. **Gully plugging**: Gully plugs can be defined as stones placed across gullies or valleys, so as to capture nutrients, silt and moisture. It is a low cost treatment for soil and water conservation in
sloppy areas. If proper maintenance is done then they are very effective for the improvement of land fertility. Better result can be achieved through top to bottom treatment of valleys.

vi. Farm Ponds: In farm ponds' system, an earthen embankment is made to capture and conserve the surface run off within the agricultural field. The rain water conserved in farm ponds could be utilised for irrigation after monsoon. People could utilise this water for drinking purpose also. It also recharges the ground water level.

vii. Plantation of trees: Trees and plants contribute unanimously to decrease the soil erosion. Therefore, there is a need of planting trees around the field or wherever it is possible, as it helps to conserve the soil, raise the ground water level, decrease the evaporation rate and increase the fertility of soil.

viii. Soil survey and testing: Quality of soil (NPK) is not surveyed or tested every year. Soil testing will help to know the quality of soil, change in a soil quality from previous year and also the deficiency in soil. Proper treatment of soil can help to increase the yield of crop and plant growth.

b. Planning strategy to be adopted by the farmer:

i. Live Fencing: The thorny desert plants are planted on the contour bunds or sometime only around the field to increase the water retention capacity and fertility of soil and also to check the erosion due to wind. Beside this, it also helps to protect the crop from wild animals, i.e., stag and wild ass, which are found on the fringes of Rann.

ii. Land leveling and terracing: Fields on the western part of the district has a slope towards Rann, which should be leveled to decrease the rate of flow of water towards Rann. Hilly arable land on the eastern part of the district should be terraced. It will help to reduce land erosion due to rain and subsequently increase the yield of crop.

iii. Contour bunding: In contour bunding, series of earthen bunds are constructed at fixed contour intervals to intercept flow of water and at the same time to build up storage of soil moisture.
Bunds can be narrow or broad. Spacing and cross-section of bund depends mainly on slope, soil type rainfall and cropping pattern. Contour bunds also enhances the ground water recharge and decreases the rate of soil erosion.

Figure No. VII.11.

Contour Bunding In A Small Tributary Of Banas River In Banaskantha District

Source: Developed by the author

D.4. Forestry And Pasture Development:

Intrusion of Rann in the western part of the district is making the land unsuitable for agriculture. Areas with high slope and scarce vegetation in the eastern part are experiencing erosion of top soil. To cope up with these problems there is a great urgency of afforestation in the district. Afforestation will also help by providing fodder to livestock population, which is an important asset to people, living in this semi-arid district.

a. Suggestions to Forest Department for the development of forestry:

i. Afforestation: Looking at the importance of forest, government has already started afforestation works in the district. But due to high velocity of wind, non-availability of sweet water and inherent salinity at all depths, mainly in the western part, the work of afforestation has not allowed even fifty percent of sapling to survive. Therefore there is a need to take special care to the saplings by
providing adequate water and fencing. Afforestation work during summer provides lots of employment opportunity, which subsequently helps to stop the seasonal migration from the village. Besides afforestation there is also an urge to maintain the present cover of forest from further deterioration.

ii. Agro-forestry: It is reported that the various trees and annual agriculture crops can be grown together and there is no adverse effect of agricultural crops on trees or vice-versa. Singh and Lal (1969) reported that Khejri resulted in a better growth of crops grown in its vicinity, as it keeps the soil moisture regime higher under itself and also provide microbial fertilizer in the soil through nodulation (Basak and Goyal, 1975). Agro-forestry and agro-pastoral system helps to conserve soil moisture, increases the productivity of land and also decreases the rate of erosion of land.

iii. Agro-pastoral system: It is found by Centre for Arid Zone and Research Institute, Jodhpur, (CAZRI), that on the strip cropping of grasses and grain legumes involving Centaurs cilia’s grass and clusterbean (gaur) in ratio of 1:4, gaur give a higher mean yield of grain by 4:1 q/ha as against 3.8 q/hac. from the pure crop of gaur. Similarly, the fodder yield from the inter-cropping has increased by 1.45 ton/hac. Therefore, agro-pastoral system should be emphasised in arid areas.

iv. Village Forestry: Many agriculturable areas in the villages are found to be under government or panchayat. These lands are termed as wasteland and no care have been taken to develop them. If those lands are developed as a pasture land with some afforestation work, then these lands will help to provide fodder to animal, conserve the soil moisture, decrease the erosion and increase the fertility as well as the underground water level in near by areas.

v. Type of trees to be planted: The district has xerophytic type of vegetation but these trees are helping to conserve the soil moisture and are providing fodder, fuel and sometime even fruits (ber). Therefore it is much better if forestry work is based on native tree species. It is also found that eucalyptus and Presophis Juliflore (pardesi baval) need lots of water for its growth (as the growth rate of these plants is very high, so they need lots of water for its growth) which decrease
the ground water table. These trees do not allow any type of grasses to grow near them. (Refer paper cuttings)

vi. Creating Employment with forest development: Collection of forest product like gum can help to develop the economic condition of many poor houses. Acacia senegal (Kumbhtia) and Acacia nilotica (Babul) produce a high quality gum, which can be collected and sold to government. This will also help to save the plants as the villagers will know the value of these plants.

b. For village panchayat or NGOs:
   
i. Development of Nursery: Nursery should be developed by local people only, as it will give them employment as well as work of afforestation will be encouraged. In Kachchh, SEWA has enforced many village panchayats to lease the wasteland to woman's organisation in exchange of 1/3 profit of the nursery income.

D.5. Livestock And Dairy Developments:

Animal husbandry is the second largest earning source of the people in this semi-arid region of the district. Development of livestock farming will help to sustain for longer periods during drought, as it is more drought resistant than crops. It is also proved by student 't' test of correlation that rainfall and cattle density have insignificant relationship (Appendix No.10.). therefore, animal husbandry should be given preference for the economic sustainability of the region. Animal husbandry has helped to develop many small scale industries, giving extra source of income to the residents of the region. Therefore, it is important that special attention should be given to develop and save this resource. There are few points that should be preferred for the development of this resource, they are:

a. Suggestions to Animal Husbandry Department for the development of livestock:
   
i. Development of Pasture Lands: Villages in arid and semi-arid area are mainly surrounded by pasture lands owned by government or panchayat. Due to neglected view to protect it by villagers and government and over-exploitation by users, these areas have been changed into wasteland without any vegetation. A village society should be made to develop these lands as a
pasture land, and sell its product to villagers during drought or dry season. Development of these lands will also help to retain the soil moisture and erosion.

ii. **Cattle Camps**: Cattle camps were organised by government or NGOs to save animals during drought. But sometimes it was so late that half of the animal population dies due to lack of fodder and water. Therefore, cattle camp should be opened as soon as the deficiency of water is realized in a region. It is not possible to open a cattle camp for every village, but at least a cluster of villages should have one cattle camp, so that the villagers should not have to go far to send their cattle to cattle camps.

iii. Many cattle rearers do not like to give their cattle to cattle camp as they think that cattle camp does not take much care to their cattle. Sometimes, people do not want to give their cattle, as they need them for milk and other household work. Therefore during drought, government should also distribute or sell fodder in reasonable price to cattle owners.

iv. **Camps for sheep and goats**: Livestock rearers of arid regions with cows and buffaloes also rear sheep and goats (they prefer to keep sheep and goats as they get more output from them than cattle) with cows and buffaloes. Sheep and goats cannot sustain for a longer period without fodder and water therefore they are more affected than any other animals during drought. Government does not provide any type of help to save these animals. Rearers have to migrate with their cattle to green areas, but they lose many animals due to scorchy heat, lack of water and fodder in the way. Therefore government should also plan to save these animals during drought by providing fodder, water and medical facility.

v. **Distribution of milch animals**: Government should give loans to people to buy good quality of milch animals. Good quality milch animals can bring a boost to the dairy industry in the district.

vi. **Financial and technical assistance to milk producers through cooperatives**: Every village should have cooperative society, which will collect and sell the milk and milk products to dairy farms.
Financial and technical assistance should be given to develop the cooperative and to purchase good quality milch animals.

vii. **Veterinary Centers**: Veterinary centers should be opened for the treatment of animals. Animals should be vaccinated to prevent from many diseases. It is not possible to open veterinary centers at every village and cattle cannot be taken to far away distances for their treatment, therefore mobile veterinary dispensaries should be opened.

viii. **Poultry**: Poultry development needs proper training to person. Poultry can be opened anywhere, it doesn't need much water and grains like cattle and if market is available then it can be taken by villagers as a source of economic development.

b. **For village panchayat or NGOs**:
   i. **Water tank in village**: Every village should have a common water tank for animals, which should be taken care by village society.

   ii. **Fodder Development**: Banaskantha is a semi arid district, but it provides a numerous variety of annual grasses and weeds for fodder. These grasses can be used as fodder for cattle population in dry seasons also if developed properly. The perennial grasses like Cenobrus Setigerus (Dhaman), Cenctious Ciliaris (Anjan), Lasiurus Sindicus (Sewan), Dichanthium Annulatum (Karad) And Panicum Antidotale (Gramma) are well adapted to the dry condition and provide nutritive and palatable forage to the livestock. Shrub or trees should be encouraged which will upgrade the degraded grazing land and in addition will check wind erosion, which consequently brings a change in the micro-habitat, creating favourable conditions for succession of better species of perennial grasses. Prosophis cineroria (khejri) and zizyphus nummularia (Bordi) classed as the best top feeds for cattle, sheep and camel in arid region. Yield of these species is also good.

   The probability rating for leaves of different top feed species in order to preference are:
   1) Acacia nilotica (Babul)
   2) Prosophis cineraria (Khejri)

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3). Salvador deoides (Piler)
4). Zizyphus nummularia (Bordi)
5). Acacia Senegal
6). Acacia lebbek
7). Acacia pendula
8). Calligonum polygonoides
9). Grewia tenax

Prosophis juliflore, though rich in crude protein are not palatable to livestock as they contain bitter substance. (Refer paper cuttings).

Fodder crop, which needs minimum water for growth and can be grown in a less time should be practiced after the rabi-crop. Fodder crop also helps to conserve moisture in soil.

c. Suggestions for the livestock rearers:

i) Camel Rearing: Due to development of transportation services, value of camel as an important resource has decreased a lot, as it was mainly used as a means of transportation in the arid region. But it should be considered that camel is much more drought resistant than any other animal in arid regions. If the market for camel products like camel hair, bones, skin and milk (mainly consumed by local peoples only) be developed, then camel rearing can be proved to be a better and reliable source of income for the people of this region.

D.6. Alternative Energy Resources:

Fuel for cooking is one of the major cause of deforestation in the area. If alternative resources are provided then it will help not only to save our precious forest resources, but also help the small children (mainly girls) of houses, who spent four to five hours a day just to collect the fuel. Hence, to meet the energy requirements in an optimal manner there is a need to minimise the total annual costs of energy or minimisation of non-local resources or maximisation of system overall efficiency. Many alternative energy resources are available which can be utilized to save our forest and the labour.
Planning Strategy for the Integrated Development of the District

a. Suggestions to Government Organisation for the development of alternative energy resources:
   
i. Biogas is considered one of the major source of energy mainly in semi-arid area because these areas are usually a large number of cattle population. But biogas plant is suitable only in those areas, which have large number of cattle population and enough water, as biogas plant needs lots of water. Therefore, biogas can be suggested only in eastern talukas, whereas in western talukas the cattle are abandoned during summer and water is not enough even for household works. In this type of circumstances, the biogas plant cannot be suggested.

   ii. Wind and solar are the best suited energy resources in the dry western part of district, as it has a high velocity radiation (Gujarat and Rajasthan have solar radiation more than any other part of country). The cost price to start these resources will be high, but with the government subsidy, these energy resources are appropriate for household purpose and agricultural purposes. In the long run, these energy resources will be more economical.

D.7. Human Resource Management:
Planning of any area is practiced to decrease the suffering of human beings and if the programme does not involve the local people, it is not going to last for a long period. All the programmes should be done with the knowledge and interest of local people for the swift run of programme after completion.

a. Suggestions to Government Organisation for the development of human resources:
   
i. Saving and Credit System: Local saving should be encouraged where every household should save something and small credit should be given to households mainly for agricultural purpose and purchase of livestock.

   ii. Women’s employment: Women in Banaskantha have a rich heritage of crafts. SEWA has used this heritage for the economic development of households in Radhanpur and Santalpur taluka. Organisation is providing skill training, designs, raw material and marketing. In this way SEWA has helped to give employment to many women’s. But this organisation is working in very few
villages. A work like this should be encouraged in all other villages also. A local talent should be encouraged and Government should help to provide raw-material and marketing.

iii. **Education and Training** : District has a very low percentage of literacy rate. Hence, to increase the percentage of literates, State Government has introduced a mid-day meal in schools. This scheme has helped to increase the literacy rate at some percentage. Children migrating with their family every year to Rann of Kachchh should be provided with school facility in destination area (started by many NGOs). School term in our country clashes with cultivation period. During monsoon (July, August and September) agricultural field needs maximum labour, at that period students have to leave the school to work in their field. Hence, evening school should be preferred in the villages or school term should be flexible which can be adjusted according to the cultivation period. As the villagers are still stuck to traditional method, new-technology of agriculture and livestock should be introduced to villagers by various NGOs and government organisation. Training to develop various skills should also be encouraged in the village so that new employment would be created.

iv. **Generation of Employment** : Beside agriculture, the other employment opportunities should be made, so that the farmer should sustain himself during the dry season. Animal husbandry, forestry and cottage industry should be encouraged so that the people would have occupation during lean season also. Employment opportunity within the village will help to decrease the migration also.

v. **Improvement of Infrastructural facility** : It is found that improvement of road network in Radhanpur taluka has helped to develop the taluka, therefore the communication system should be developed, as it also helps to develop small industries and marketing of agricultural products. Better education helps to broaden the view of a person, which increases the faster adaptability of new technology.
Poor water quality, stagnant water during monsoon years and working in unprotective condition in salt pans, etc. has resulted in many diseases like malaria etc., in the region. Better medical facility will help to improve the health and hygiene in these areas.

b. For village panchayat or NGOs:
   
i. Participatory Rural Appraisal: Participatory Rural Appraisal (PRA) is a recent trend, now followed in most of the regional planning strategies for the development of the region. It is a methodology for interacting with the villagers personally by government organisations and NGOs, to develop an understanding about them and learning from them. It involves the villagers' role in planning strategy, where they can put forward their point of view about various issues enabling them to analyse, reflect and derive action plans based on their own experiences. Therefore before any micro level planning PRA should be made, which will provide the subjective view point of the area, its inhabitants and the local economy. Planning through PRA will be easily accepted by villagers and also will help to run the programme after it is over.

   ii. Formation of village organisation: Every village should have village organisation, where a representative from every community and caste should be selected and whole village should participate during meeting to discuss their problems. These types of organisational meeting will help to share the knowledge and solve problems.

   A pani-panchayat should be made, so that the farmers having field near the water source, should not over-utilize the source for irrigation. When the water is not enough for drinking purpose during summer season or when the year received a lean rainfall then panchayat should prohibit the use of water for irrigation. Crops which need lots of irrigation should not be encouraged to be cultivated in the village where water is scarce for living purpose. A representative from a village should be elected, who will look after the problems of water and villagers and report it to the related government organisation.
D.8. Other than these management aspects, there is a need of some regulations, which should be imposed by the government for the proper distribution, and utilization of water. The following regulations should be imposed:

a) Check extravagant use of water in domestic sector by minimising the supply of water.

b) Check water intensive uses in agriculture by checking the type of crops grown.

c) Ban water intensive industries or commercial activities in water deficit areas.

d) Attach appropriate price tag to water supplied for all users using over and above minimum quantity needed in human/cattle consumption. If water is supplied through a single tap to whole village then price should be paid by whole village for over using the water resources.

e) Preservation of water sources against over exploitation.

Government should adopt the following strategies for the development of water resources in drought prone areas:

a) Harness fully renewable and rechargeable water resources.

b) Regulate tapping of ground water, particularly the static reserves.

c) Coordinated management of all such water sources through water resources administration at state and district level.

d) Recognition of water as an essential community in short supply and as a community wealth of the village.

Beside these programmes, there is a need to understand and assess the pattern of monsoon. So that farmers can be warned beforehand to take the necessary precaution for their crops. India Meteorological Department has already done a lot of research work to assess the monsoon pattern. Still, more research work is needed to understand the onset and withdrawal of monsoon and its pattern during this period.

In a joint effort of Asian member countries to combat desertification, a regional action programme (RAP) is launched in 1997. Aim of this programme is to take suitable measures for combating desertification. Similar type of programme is needed to study the pattern of rainfall for the prior
information about monsoon. The programme should work in following pattern to support drought areas. (Figure No.VII.12.)

Figure No. VII.12
Pattern Of Programme To Support Drought Prone Areas

Source: Developed by the author

E. Conclusion

Various methods, suggested to increase the land and water capability of the district, are to be adopted as per the available resources of the area. Suitable agricultural practices should be used for longer sustainability of crop during dry period and also to get better yield. Forest, pastures, livestock and energy resources should also be developed for the sustainability of the region during drought years. At last but not the least, development of human resources should be given proper attention, as all the planning strategies are meant for the them only.

All the planning strategies suggested to develop the various resources for the integrated development of the drought prone area, should be applied after a proper study of physical, climatological and socio-economic aspects of the area. An appropriate consideration should also be given to the perception of the local people. Development of drought prone backward talukas of the district requires human understanding and proper learning to live with the harsh environment. It requires integrated management and organisation of people for the optimum utilization and conservation of the available resources. This could be achieved through interactions and negotiations between various government organisations, NGOs and local people at national, district and local levels. The following idea is given in Figure No.VII.13.
Figure No.VII.13.

Flow Chart For The Integrated Development Of Villages

Source: Developed by the author