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- Agricultural-based activities
- Forestry-based activities
- Horticulture-based activities
- Fishery and related activities
- Small enterprises in the watershed (value addition to the products, improved efficiency of operations etc.)
CHAPTER – 3
WATER MANAGEMENT AND CONSERVATION

3.1 INTRODUCTION WITH REFERENCE TO THE VEDAS, UPPANISHADS AND BHAGVAD GITA

The Indian Philosophy through its Vedas, Upanishads and Bhagvad Gita has given a high ranking to the importance of water. In the Vedic literature one of the five important elements mentioned therein is Water. Water is known as “Aapah” in Sanskrit. The names of the five elements mentioned in the Vedic literature are Earth, Air, Water, Fire and Sky. In the Rigveda, one of the hymns mention that,

“May the water available from the skies as rain, the water available in the culverts/canals, water flowing in streams and rivers and the water flowing towards the ocean be instrumental in increasing my happiness.”

Rigveda 4/164-51

ॐ आपो हिष्ठा मयोभुव: । ॐ ता न उजै दधातन ।
ॐ महेरणाय यक्से । ॐ यां व: शिवतमो रस: ।
ॐ तस्य भाजय तेह न: । ॐ उशतीरिव मातर: ।
ॐ तस्मा अरं गमाम व: । ॐ यस्य क्षयाय जिन्तथ
ॐ आपो जनयथा च न: ।
Apart from this, the Yajurveda also has hymns pertaining to Water. These hymns are about offering prayers for easy accessibility of water and also for enlightening life with its presence. The shloka says that “Oh water, you are undoubtedly our well-wisher.”

Just as a Mother who breast feeds her baby in order to increase its strength and make it content, similarly Water makes us complacent with its taste. All the life forms in this world are gratified with your occurrence, may we gain the strength to withstand your total presence

Or

“That which sates the life in universe, may we receive that cosmic water and the ability to partake it fully”

Yajurveda 17/36

Arthveda “In those deserts where water is present, it is available from ponds, the water we fill in pitchers/pots, water available through rains, may all this water be beneficial to us.

Atharvaveda 11/4
In the verses of Bhagvad Geeta also the importance of rain water has been specified. In the 3rd Chapter Shri Krishna, says that all the living beings are thriving due to availability of food. Food is the result of rains. And Rain is nothing but pouring water.

The God of Water is known as Varun and he is worshipped in the Vedic hymns. One Rigveda hymn states that,“Hey Varun dev, Hey Water God, Please bestow prosperity on us.” Thus the importance of water has been highlighted in the Indian Philosophy as well as in the religious texts of India.

World history is a witness to the fact that whenever and wherever human civilizations were set up; they have always flourished and progressed at the river banks. During the Aryan civilization it developed on the banks of Sindhu and gave rise to the Sindhu culture, later on it flourished on the banks of Ganga, Jamuna. In ancient Egypt it developed on the river banks of the mighty Nile and Mesopotamia civilization came up on Tigris River. In the world wherever the human civilization came up, it has always been developed close to geographical areas having water bodies.

3.2 IMPORTANCE OF WATER FOR MANKIND

The different cultures and religions in the whole world are the essence of the various human civilizations and revere as part of the nation’s
beliefs and traditions. Cultural differences or rather experiences play a key role in the way water is perceived, its usage, valued and managed in societies. But the underlining common fact is that Water is Life. Just like Hindu philosophy even the Greeks and Chinese also considered Water to be one of the five elements of life. Since water is symbolic to cleanliness and purification, many religions have various rituals, beliefs and traditions that associate water with the power to cleanse us of our impurities. Water plays a strong role in both life and death for everyone. Many religions recognize this significance and relate it with their own rituals of either birth or death or to wash away their sins. Life is nourished by water. Water has the power to create as well as destroy life. Our whole identity is dependent on water.

Human life is dependent on the five basic elements. Of them water is one of the utmost important element and needed aspect. We may say that the whole core of human existence is undoubtedly reliant on Air and Water. Breathing of air is extremely vital for human existence and similarly water is also equally imperative for proper functioning of our body. It is a known scientific fact /Medical science states that just like a person dying due to lack of oxygen similarly a person may also perish due to lack of water. When the amount of water in the body decreases it is called as dehydration and to overcome this, the affected person is made to consume lot of water. O.R.S. (Oral Rehydration Solution) is usually administered to such people to combat the loss of fluids. The Human body structure itself is made up of mostly fluids. Thus water is equally important for the environment/nature and also for the human body. Just like the presence of water in our body helps it to cool down similarly water stops the Earth from getting colder. A Human body contains nearly 70% of water or fluids. His brain has 74.5% fluids, bones have 22%, urinary bladder has 82.7%, muscles have 75% and blood comprises of 83%. Thus water is of such paramount importance for the existence and survival of human life that it won’t be possible to sum it up in a few words.

Since the need of water is inevitable due to its vast benefits it is in demand at all times and in all the sectors. In the agricultural sector alone an
estimated 73% of water is consumed. Moreover the use of water in Industries is completely inexorable. Eg. For producing one litre petrol 10 litres of water is required, for generating one kg paper 100 litres water is needed, for growing 1 kg rice 4500 litres of water is needed, for manufacturing 1 ton cement again 4500 litre water is required and for creating 1 ton iron 20000 litres water is used. Thus for the formation of any substance the presence of water in any forms, either solid or liquid or gaseous is inevitable. Thus from steam we get rains, and from rains we again have matter in form of water and ice on Earth. This is a never ending cycle.

Water is available in three forms.

3.2.1. Solid Form

When we keep water below freezing point it turns into ice which is its solid form. In the liquid form we have water and in its gaseous stage it is vapour. Water is invaluable to the human existence in all these three forms. Ice acts as a preservative and keeps things from getting spoilt like vegetables, fruits and dairy products.

3.2.2. Liquid Form

Water in its liquid state is related with the human life in numerous ways like cooking, house cleaning, washing clothes, and bathing. Thus it is a very important part of one’s life.

3.2.3. Gaseous Form

The water in its gaseous form namely Steam is useful in running locomotives, other industrial machines and also in cooking. A simple example of this would be the humble pressure cooker which runs on this principle and is usually present in all homes.
3.3. TYPES OF WATER SOURCES

Water forms not only an important part of this world but due to its being the most coveted liquid which is needed not only to nurture Flora and Fauna but also the entire Universe. Since it is one of the most important factors accountable for human existence it is also imperative that we study or know about the different sources of water. The various types of water sources are mentioned here.

3.3.1. Rains

3.3.2. Rivers and canals

3.3.3. Lakes and ponds

3.3.4. Wells

3.3.5. Step wells

3.3.6. Soak pits

3.3.7. Bore wells

3.3.1. Rains

Rain is one of the main sources of water that is provided by Nature. It is like a blessing to Mankind. The phenomenon of Rain has been in place, since the times of the geological and biological evolution of the Earth due to the seasonal cycle. Based on the difference in topography the rainfall pattern is also different across the Globe. But undoubtedly Rain is the boon of human existence and keeps it functioning.

India has Monsoonal rain and that is usually during the four months of Rainy season due to the South West monsoon winds known as “Nairutya Maarut”. The proportion of rainfall isn’t similar in India. In the states of Rajasthan and Kutch the amount of Rainfall is quite less whereas in Meghalaya, Assam and Southern India it rains quite heavily. Even in the state of Gujarat the rainfall is not equal at all places. While the areas of Kutch and
North Gujarat receive less rainfall the areas under South Gujarat especially Dang and Valsad districts receive maximum rainfall. The reason behind this is its geographical layout which has the Sahyadri mountain range. When the water usage is high against its availability then we start experiencing its shortage very quickly. The underground water table also recedes faster. Due to irregular and insufficient rains we don’t get enough rain water for storage. Due to these reasons conservation of water becomes the need of the hour.

### 3.3.2. Rivers and Canals

Rivers are the next in line after rains as a good source of water along with the canals which is formed through them. The river water is basically rain water which is stored in the mountains. When the “glacier” on the mountain starts melting and flows, it forms rivers or else it may merge with another stream along the way. In India the number of rivers which are flowing throughout the year is quite less. The rivers which originate from the Himalayan mountain range like Ganga, Brahmaputra, Jamuna, Ravi, Jhelum, Sutlej etc. have a regular flow through the year. These rivers sometimes get flooded due to the monsoon rains or else during summers the flow of water increases due to melting of ice. Similarly in Southern India since rainfall is heavy the rivers maintain their flow throughout the year.

In Gujarat and specifically in its Saurashtra region, the number of rivers that flow all the year round is very less. In South Gujarat the Narmada and Tapi rivers are the only ones which flow throughout the year whereas in North Gujarat and Saurashtra, there are no rivers which have continuous flow of water. Canals are created from the rivers and water is diverted towards areas having water shortage for use in irrigation. This water can also be sent via aqueducts to the cities to be consumed as drinking water. Under the Five year plans of the Indian Government there is a mention of creating dams across the big rivers and sending the stored water via canals across the different parts of the State so that water does not get drained in the oceans and seas.
The famous Narmada dam in Gujarat is situated at Navagam in Bharuch district. And through the various canals built into it, water now reaches parts of North Gujarat, Saurashtra and borders of Kutch. Through the Narmada Yojana, water is provided to the states of Rajasthan, Madhya Pradesh and Maharashtra also.

**Swarnim Jalshakti Mahotsav, Rajkot**

**Gujarat:**

- The growth in agricultural sector of the State has nearly doubled in this decade against the last one.
- Increase in potable water and water storage as well as estimated increase of 13.00 lakh hectare (32.11 lakh acre) of land under cultivation in a decade.
- The State’s agricultural produce has gone up from Rs. 14,000 crores to an estimated Rs. 60,000 crores in one decade.

**Sardar Sarovar Yojana:**

- Through the Sardar Sarovar Yojana, a total of 18.45 lakh hectares
(45.57 lakh acres) shall be irrigated in 3117 villages across 14 districts of the State.

- With the River Bed and Canal Bed Power House being installed which has a capacity of 1450 megawatts, a total of 18,663 billion units of green energy were produced till the end of March 2011.

- The main canal of Narmada which is 458 kilometres long and has the capacity to flow 40,000 cusecs is now ready and functional till Rajasthan.

**Saurashtra Branch Canal:**

- The length of the Saurashtra Branch Canal is 104.46 kilometres long and has a capacity to flow 14,000 cusecs.

- In Saurashtra belt, Rs 4500 crores have been spent on Narmada Yojana to bring 12,99,672 acres of land under irrigation.

- In order to lift the water by 72 metres and carry it to areas which are at a height, Rs. 540 crores has been spent on constructing pumping stations at 5 places.

- In the districts of Surendranagar, Bhavnagar and Rajkot which comes under Saurashtra region a total of 4,56,706 hectares (12,99,672 acres) of 511 villages belonging to 14 talukas have been provided with irrigation facilities.

- In 7 districts of Saurashtra, potable water has been provided to 4887 villages and 90 towns.

Thus, Rivers and Canals are a good medium to provide water for drinking and for irrigation.
3.3.3. Lakes and Ponds

In India there is less number of lakes against the total number of Rivers. There is a definite distinction in size between lakes and ponds. In the rural areas we can usually see a pond on the fringes of villages which is rain fed. The stored water is utilized by the villagers in many ways. Due to the filled pond, the level of water in the wells and step wells go up. This water is used for drinking purposes whereas the water in the ponds is used for cleaning and washing. If the depth of the pond is increased whenever the water levels are depleted, water can be conserved for a long time.

3.4. TYPES OF WATER

As per the opinion of Dr John R. Christopher there are 7 types of water which is listed below for your reference.
1. **Hard Water**

This type of water is prevalent in rocky and mountainous areas. This water type is called hard because it has a high mineral content of Calcium, Iron, and Magnesium etc. which is difficult to be absorbed by human body.

2. **Boiled Water**

Usually Hard water is boiled so that the minerals content in it is reduced and it becomes totally sanitized and fit for human consumption. Jain religion endorses that water is boiled before consumption.

3. **Fresh Water (not boiled)**

The water obtained from Rivers, Ponds and Wells is known as Fresh water. This type of water may contain some amount of microbes or germs.

4. **Rain Water**

The rain water which pours down is totally pure. But after coming in contact with the ground it may then get contaminated to some extent.

5. **Melt water (water from melting Ice/snow)**

In the mountainous region where it snows or where ice is formed, water is formed when it starts melting. This water is not always safe for drinking since it may contain microbes, germs and mineral traces.

6. **Filtered water**

The process of filtering Rainwater and also fresh water is carried out using the best suited methodology to make it totally germ-free. Filtration is considered to be one of the best suited methods for making water hygienic for consumption. Nowadays with the help of upcoming technology there are different types of water purifiers in place.
7. **Soft Water**

When the traces or amount of minerals present in the water is less, then such water is known as Soft water. It is better for human consumption than hard water.

**3.5. VARIOUS USES OF WATER**

Just like Air, Water is also one of the primary components of the atmosphere and it is very vital for the existence of human mankind. Water is paramount in many aspects of human life as well as the society. In the local dialect of Gujarati language the meaning of water means power which is testimony to the fact that water is synonymous with imparting strength to mankind. The different uses of water are listed below:

3.5.1. Use of water for Mankind

3.5.2. Use of water in Farming & Horticulture

3.5.3. Use of water in Medicines

3.5.4. Use of water in Industries

3.5.5. Use of Water in Transport Industry

3.5.6. Use of Water as Fire Extinguisher

3.5.7. Use of Water in Construction
3.5.1. Use of water for Mankind:

The whole human race is totally dependent on water for its survival. Nothing can be achieved without the availability of water. Water plays a prominent role not only in maintaining the health of the human body and keeping it free from diseases but also in sustaining the mankind. It is almost impossible to envisage a home functioning without water. We need it for cooking food, cleaning dishes, mopping floor, washing clothes etc. From the moment a person wakes up in the morning till the time he sleeps he is dependent on water. During the whole time that he is active he is totally reliant on water. Just as we cannot visualize a world in existence in the absence of air, similarly we can’t foresee our survival in the absence of water.
3.5.2. Use of Water for Farming & Horticulture:

Just as humans can’t do without water for their daily ablutions and other needs similarly water is extremely important for farming and horticulture sector. We can observe that agriculture produce is high in nations having good water resources. Production of food grains depends on successful farming and farming depends on availability on the water sources. Famines are caused when there is dearth of rainfall and the human race has to suffer the consequences. All the agricultural produce like food grains, vegetables, fruits, etc. totally depends on water.

3.5.3. Use of Water for Medicines:

Medicines can help you feel better and get well when you are sick. Everyone usually needs medicines once in a while to keep themselves fit and safe from diseases or infections. Water is an integral component in the medicinal arena. Whatever therapy we use for curing the symptoms present in the patient water is definitely part of the treatment process. Water is utilized while preparing medicines and also while consuming the medicines. When a person is having fever, water is used to bring the fever down. Mahatma Gandhi had used water therapy effectively to treat many people of their ailments.
3.5.4. Use of Water in Industries:

The industrial sector also cannot perform without water. Water is a must at each stage of the production of any material. While producing some material, either the process is depending on water, or it may be used in preparation of the needed raw material. Moreover water is useful in the process of cooling down the machinery. Nowadays in the industries they are maintaining small green belts in order to do their bit for the environment. They are developing gardens around the factory premises. Thus water is again needed for watering the plants. The management of Industries is not only dependent on the invested Capital and Human resources but also on water.

3.5.5. Use of Water in Transport Industry:

Water again is a very important factor in the Transport sector for all the types of vehicles. Be it the Railways, Road transport, Shipping or Aviation industry: water is a requisite requirement for all of them. Earlier when the railway engines were running on coal, water was very essential. But since the advent of diesel and electric run engines in the railways, the demand for water has receded. But of course water is still needed for quenching the need of the travellers in all the transport services.

3.5.6. Use of Water as Fire Extinguisher:

The correlation between Fire and water has been known to Man since ages. In order to extinguish or put out fires it is required to use water in full force. In the fire engines used to save human lives and prevent loss of property, adequate water is stored to snuff out the fires from blazing ahead.

3.5.7. Use of Water in Construction business:

In the field of construction business, water again has a very significant role to play. For any type of construction to happen, water is a must. Whether it is the construction of roads or building houses or erecting dams, a
concrete mixture of bricks, cement and lime is made ready using water. This is the basic requirement for making the mixture.

3.6. UNDERGROUND WATER DEVELOPMENT PROGRAMS IN INDIA

India being a vast country where farming is one of the major occupations, obviously its water consumption will be high. Due to the large spatial and temporal variability in the rainfall, water resources distribution in the country is highly skewed in space, and time. Thus this results in difference both in water volume and flow of the rivers. Rivers play an important role in shaping the social life and identity for the culture which develops close to them. In India the rivers flow as well as the height of the underground water table also differs. The main sources that feed the underground water table are the rain water and the lakes. In the states of North India like Uttar Pradesh, Haryana, Delhi, Punjab there are many rivers which are flowing through the year and thus there is good cultivation seen. And the underground water table level is also quite high in these areas.

Dr B.T. Babariya mentions in his thesis about the Underground water conservation activities and its socio–economic impact. Of the world's total population, 17% are residing in India. When we compare the water volume/outflow of flowing rivers in similar way, only 7% of the total volume/outflow of rivers is present in India. Thus compared to the population of India, the volume of water is quite less as against the required amount.

Dr B.T. Babariya specifically mentions that generally in each monsoon season we receive an approximate precipitation of 3000 mm/yr. Of that around 2400 mm/yr river runoff flows into the oceans and only 600 mm/yr remains stored in rivers, ponds and surface water of which again a substantial amount gets evaporated. Around 15% of the country’s need of potable water is met through the surface water sources and 85% is met through underground water sources. Since large amount of water is wasted since it flows back to oceans it can’t be utilised much for drinking or farming
purposes. As a consequence we have to depend on the underground water sources for drinking.

India has started to take extensive measures in order to conserve and protect the underground water table as well as total water resources. Two agencies have been functional for the same

1. Central Water Commission
2. Central Ground Water Board

There is considerable dearth of water even though on one hand we are witness to industrial growth, more farm produce and of course increasing population. Definitely the World Bank is actively involved in helping India in its water development programs. But we have to remember that Water is a natural resource which can’t be acquired by sheer capital.

3.7 UNDERGROUND WATER CONSERVATION PROGRAM – GUJARAT

Gujarat State lies in the western India and has an estimated area of 1,90,600 sq km along with around a crore’s population. It is among one of the fastest economically growing States of India where industrial growth along
with agriculture is happening in leaps and bounds. Many districts of Gujarat are well known for their industrial progress and economic growth. The area from Mehsana, till Valsad and Navsari is part of the prestigious Golden Corridor, which forms a portion of the highway network (Golden Quadrilateral) being constructed to increase the connectivity across the length and breadth of this country. Mehsana, Ahmedabad, Anand, Vadodara, Bharuch, Ankleshwar, Surat, Vapi and Valsad are some of the economically throbbing districts of Gujarat. Gujarat has also demarcated some areas as “Special Economic Zones” in order to encourage its industrial growth. Water is the key factor for growth of the industrial sector along with human resources and machinery. Water forms a pivotal part of our lives which is needed in all areas whether it is the developing industrial sector or animal husbandry or agriculture. In order to address this issue of limited availability of water resources and against that the increase in its utility/demand the need of the hour is definite planning and coordination.

The depletion in water resources is a matter of great concern. Especially when the natural wealth of the state is being continuously being exploited it becomes necessary to uphold and conserve the water sources by taking adequate measures. It is worth mentioning here that the issues pertaining to Gujarat’s underground sources are reaching the critical phase where it shall be adversely affecting the farming/agriculture, industries and household needs in days to come if not heeded to.

Dr B.T. Babariya mentions that the estimated amount of water flowing in the rivers annually is 1880 cubic mts. Of that Gujarat has a proportion of around 89.71 cubic mts. Of the total water used for consumption in Gujarat, 39.15% is supplied through South Gujarat whereas only 24.5% is from North Gujarat. Saurashtra accounts for 32.4% and Kutch 3.96% of water supply in the State. Thus the supply of water from the southern part of Gujarat to the whole state is comparatively higher while the ratio of water supply from the areas of Kutch and North Gujarat is less.
Dr B.T. Babariya says further in this regard that Gujarat data shows that in terms of water resources in 1971 per capita water availability was 2000 cubic mts. Now it has decreased to 1200 cubic mts in 1989-1999. In 2010 it is predicted that the per capita water availability shall further decrease to 910 cubic mts. In Gujarat the demand of water is much more than the supply. As a consequence, due to the variance between the availability and shortage of water supply many questions arise.

**Gujarat Conservation and Economic Analysis**

When the demand of water is inversely proportional to its supply, due to this imbalance water also derives economic status like other materialistic goods. In Gujarat the questions related to water supply are concerning. Water can be considered as a social property, thus its availability as well as usage needs to have societal norms/controls in place.

In Gujarat, 40% of the population resides in the Urban areas and for completion of their daily tasks have to be dependent on other sources for obtaining water. Thus they are bound to face shortage of water. So it becomes imperative that in the cities optimal utilization of rainfall is done and water harvesting techniques are embraced totally. This also calls for making the people more aware of such techniques. Water harvesting can be easily implemented in the urban areas since the buildings are made using cement & bricks and it becomes easier for the water to be accumulated in
one place. In the villages the community should come together to ensure how traditional local systems can be used to manage water supply, water sources can be utilised maximally for the benefit of villagers themselves and how it can work best in collaboration with the different government schemes in place.

In the past two decades, many have attempted to understand all the issues and factors associated with water and also the ever changing situations in context of the National as well as International scenario, but in vain. Sri R.K. Sama, representative from Water and Sanitation Management Organization (WASMO) agency, the demands for utilization and management of needs is equivalent to the need of water management. He goes on to say that compared to other states of India, Gujarat has got fewer facilities in terms of water resources. Due to the uneven and erratic rainfall patterns in Gujarat state, while some areas like Southern Gujarat receive an estimated 1500 ml or more rain, North and Central Gujarat receives around 300 ml rainfall and sometimes they face draught also.

In this context, Dr B.T. Babariya mentions that for supplying water to other regions, the expenditure involved is colossal. The reason being that at least 80% of water needs to be transported to far away areas or regions. As per some estimates, the costs incurred while sending water to one village under the RWSS (Regional Water Supply Scheme) 20 ml to 670 ml. In his opinion, the cost incurred while transporting water is less than the recovery costs. It basically means that the recovery costs are not adequately met.

The ever increasing ratio of urbanization as well as industrialization is not helping either in sustaining the water resource in Gujarat. While it is petrifying to think of even hypothetically about life in total absence of water, it is equally scary to think of situations wherein potable water is not available. The ever swelling population raises questions in our minds as how to tackle this problem of water shortage crisis. As per one study it has been estimated that while in one urban home, on an average 50 litres water is utilized while
flushing in the toilets, in another part of the world people don’t have access to even 20 to 50 litres of water per day which they need in order to survive. Along with the need to think about the economics of water dynamics, it is also important to know about the people’s mind set. The civil society cannot be excused from their responsibilities by arguing that onus of water conservation, availability and its purpose rests squarely on the government. This is because water accessibility and conservation can be managed very effectively by the people’s participation model.

3.8 GLIMPSE OF VARIOUS WATER CONSERVATION PROGRAMS IN GUJARAT

Two methods of water conservation are well known; the surface flow schemes and the ground water schemes.

- **Surface Flow Schemes:**
  - Huge dams on Rivers
  - Small and Medium sized dams on Rivers
  - Check dams
  - Wells as well as Step wells recharge
- Farm ponds and Soak pits
- Deepening the lakes
- Bunds/Embankments: Gully plugging
- Watershed

**Huge Dams on Rivers**

During monsoon rivers get flooded and if this water is stopped from flowing into the oceans and seas then it can be conserved and utilized during water shortage. Due to the ever growing technology and science, the methodology of building big or small dams on the rivers is developing and this phenomenon is now seen in India also. Huge dams have already been constructed on rivers in the various States like Gujarat, Uttar Pradesh, Haryana, Punjab, Maharashtra and parts of Southern India. In Gujarat, dams have been built on the Narmada, Tapi, Sabarmati and Badar Shetrunjji rivers. The water accumulated in the reservoirs is later sent to other areas via the canal system for the purpose of irrigation and drinking. The Narmada Project is the largest irrigation program in Gujarat state and its water benefits areas of Maharashtra, Rajasthan, Madhya Pradesh and also the far reaching places of Gujarat. The Bhakra-Nangal Dam has a significant role to play in the socio-economic growth of Punjab and it is instrumental in making Punjab one of the thriving states in the country.

**Small and Medium sized dams on Rivers**

Small or medium sized dams are usually built on small rivers and the main purpose of these dams is to fulfil or quench the needs of that particular geographical area. Since the dams conserve water it has a positive influence on the wells also which show a rise in water levels.
Check Dams

Check dams seem to be like just another small dam built on the river but as per engineering technique there is a slight difference. Check dams are usually built on rivers which are small and have very less water flow. Thus the amount of water that gets stored in the dam is also less but still it is helpful in farming, animal husbandry and social needs. Moreover the building of check dams is quite cost effective.

Wells and Step wells Recharge

Wells and Step wells have always been an integral part of India’s history and it is thus associated very deeply with the social life and with culture. Since decades It has remained deeply etched in our way of lives, shaped our traditions and beliefs that have emerged. Step wells usually built at the fringes of the village are the reservoirs of water for the people of the village. The water levels of these wells are dependent on the rainfall, rising during monsoons and in summers it goes down. Earlier when transport facilities were not available, people in desert areas would travel either on
foot or on horseback to other villages. At that time it was the responsibility of the then Kingdom to have Step wells built between two villages. If these step wells and wells are recharged regularly it can prove to be effective in storing rain water as well as ground water.

Farm ponds and Soak Pits

Along with farm ponds soak pits are very useful in conserving water which can be later used for irrigation purpose. Since they are built close to the farm lands it proves to be more economical to the farmer in terms of time and money. The farm ponds are constructed at the lower side of the fields and the runoff from the higher side of the fields are channelized into the pond.

Moreover, since it slowly percolates in the farm the moisture content of the soil increases aiding in cultivation of crops. And along with it the construction of soak pits also help in irrigation.

There are many methods in place to conserve the rain water that falls on the surface and of them one of the most effective systems is the farm ponds. When lakes or check dams facilities are not easily accessible due to distance, then in such cases the farmer relies on the small ponds. A farm
pond is a dug out pond constructed in or near the farm. Rainwater is collected in the pond and stored for future uses such as irrigating crops, recharging groundwater, and providing drinking water for farm animals. Farm ponds have been identified as a cost effective structure with the ability to support poor farmers during lean periods and thus revitalize their livelihoods. They provide irrigation water during dry spells between rainfalls. This increases the yield, the number of crops in one year, and the diversity of crops that can be grown. They can be built keeping in mind the size of the farm so that it fits well within these farmers’ land holding size. Usually they are dug at the corner of the land so that it does not affect other farm operations like ploughing.

**Deepening the Lakes**

In order to increase the depth of the lakes first and foremost, the people need to be made aware about its advantages in all the districts. During monsoon most of the runaway water is simply wasted as there is no proper facilities in place to conserve it. If the lakes are deepened after removing the silt that has accumulated, then it can hold more water. Thus wastage of water can be reduced to a great extent and also the water woes can be addressed positively. The farmers can use this water for irrigation purpose.
3.9. WATERSHED: AN ANALYSIS

3.9.1 Introduction:

Water is undoubtedly the elixir of life and it is one of the most basic elements of this Universe. And it only due to water, that the Human existence has been possible on Earth. Water is needed to ensure food security, feed livestock, maintain organic life, and take up industrial production and to conserve the biodiversity and environment. Water And Sanitation Management Organization (WASMO) states that the progress of Mankind has been entirely due to the presence of water. And even though we are becoming privy to more changes taking place in the world and more tech savvy even then the importance of water in our lives shall never diminish, neither today or tomorrow.

However, with reckless abuse and increasing demand, due to growing population and unsustainable lifestyle, many countries are facing severe water crisis. In the absence of suitable corrective measures, many developing countries including India, will have to face crisis of food and water security in the near future. Thus it becomes imperative that we need to be very proactive in this regard and think about ways to conserve water, its usage and attainability. In order to effectively tackle the water crisis and
consciously reduce water wastage it is crucial to have a people participatory approach. The basic theory of Economics states that when a person is not able to increase his sources of income then the factors of expenditure also need to be curbed. This approach can also be applied in the context of water management.

In the whole world, the most important source of water for the total life forms on Earth is through rains. Owing to difference in the geographical conditions there is variation in the rainfall also accordingly. India due to growing human population, severe neglect and over-exploitation of this resource, water is becoming a scarce commodity. If we continue to neglect and abuse this natural wealth the day won’t be far off when it shall prove to be more costly than gold. India is more vulnerable because of the growing population and in-disciplined lifestyle. This calls for immediate attention by the stakeholders to make sustainable use of the available water resources.

Looking into the water crisis which is also present at the global level, India has kick started some programs with the aim to prevent water wastage and to make sustainable use of available natural resources. The Indian Government has initiated the program “Watershed Development Program” which has been taken up by Gujarat state too in an active manner.

This project has been executed in the villages falling under Rajkot district of Gujarat and this study shall be focussing on the same.

3.9.2 Watershed: Definition, Meaning and Concept

1. Definition

Since there is no accurate definition available for this term, “Watershed” it is difficult for the researcher to give an exact definition. But based on the available literature on this, he shall attempt to put up a working definition. The District Watershed Development Unit has mentioned in its report that “Watershed is a unit of area that includes all land and water area which contribute to common point”.

This means that watershed is such a unit wherein all the water sources from the area flow towards a single outlet.
From the above definition it is clear that from any geographical area when the water reaches to one point it is called as Watershed. Usually as per the scientific principle water flows down towards slopes or low lying areas. Thus water accumulates in one place. This is also known as Catchment area.

2. Meaning:

The runoff of any given area flows towards the point at the lower elevation and it converges at one place will acquire certain dimensions and proportions. If the water obtained through nature remains unutilized then it has three consequences. Evaporation of water due to sunlight, water percolates in the soil in areas which has moisture and thus the overall volume of water reduces. The remaining water that is conserved man can use it for his own consumption.

Since runoff water congregates at one single point after flowing in same direction, this water can be also very well conserved in the ponds, lakes, check dams or farm ponds. Nature has made such a principle that the water that flows from a high elevation like mountains or hills shall always find or make its own way to reach the lower ground.
3. The concept

Though now we are clear with the definition and meaning of the term Watershed but further analysis points out the importance of taking proper measures in order to conserve the nature resource by controlling its flow. In order that the water is able to flow without any hindrances, slope areas can be useful in channelizing the water towards the desired area.

In order to decrease the force of water which gains momentum as it flows downstream, the creation of a green belt by planting trees and shrubs is a good idea. Thus we can restrain its speed as it flows towards the common point. Moreover so as to reduce the flow of water and let it percolate better into the soil, we can make use of conservation technology already existing and in place e.g. check dams, culverts, gully plugging, bunds etc. This can be very beneficial for the cultivation of crops as the moisture content of the soil increases. Any of these efforts shall also be instrumental in reducing the volume of water that gets wasted since it finally drains into the oceans. Huge dams are built on rivers so as to check the drainage of runoff water into oceans thereby supporting water conservation and water transportation. Similarly, with some scientific intervention and technological aid, the drainage basin areas can be further developed with proper planning and this also will help in conserving water. This may be a small but significant step towards water conservation as well as water transportation.
3.9.3. Watershed: Purpose of orientation

Watershed project aims at the safe keeping of all the resources: water, land, flora, fauna and mankind, to rejuvenate as well as have considerate approach towards nature.

The basic objectives of the watershed management program are as below:

1. To ensure sustainable and efficiency in produce, safeguard and maintain the land well.
2. To protect natural resources and increase their number
3. To have control on flood occurrence and reduce the silt deposits in the lakes.
4. Increase conservation efforts, make use of stored rain water for irrigation and thus prevent drought like situation.
5. To improve Farming along with related livelihoods and also industries, support local produce and resources so that the people’s social and economic situations are upgraded.
6. Make sustainable efforts to increase the moisture content in soil and control or reduce flow of water so that problem of soil erosion is alleviated.
7. To cultivate feeling of oneness, togetherness, cooperation and unity among people.
8. Increase employment opportunities especially for the economically vulnerable population
9. No protection to saving.
10. Equal distribution of profits
11. To ensure that proper safety precautions are in place and no untoward incidents occur.
3.9.4. Criteria for Watershed selection:

When the issue of water crisis attains global proportions then water management becomes the nation’s basic need for social development. Therefore just like other commodities it is also entitled to get fair and integrated planning. Under the Watershed management approach, the selection of villages has to undergo certain criterion. This will facilitate in selection of those villages on priority where water crisis is high.

The criteria in place for selection of the villages to be included under the watershed management program are as follows:

1. Prioritize villages which are in need

The villages which are facing water scarcity are taken up on first priority basis so that much needed relief in terms of water facilities for drinking and for irrigation purposes can be provided.

2. Villages and Areas facing dire shortage of potable water

As discussed before, a man’s identity depends on availability of water and thus those villages or areas which are facing severe water shortage are given priority in this program.
3. Wastelands are more in proportion
When the land is not viable for farming owing to non-availability of water then such areas are identified and covered under the program so that it can become productive once more.

4. Community participation is high
For the Watershed program to be able to run smoothly and in coordination, one of the most important factors responsible is the extent of the people’s support towards it. Thus people’s participation and contribution plays a crucial role in fulfilling the demand for water.

5. For economically weaker and backward class sections in need of gainful employment
In villages where the proportion of economically deprived sections and backward classes are more, then such villages are taken up so as to provide them with employment opportunities.

6. Community Ownership of land is high
In India, this concept of Community Ownership among farm owners is not seen. The reason being that agricultural land is usually distributed in parts. In spite of this wherever we come across such type of land pattern it shall be included in the program.

7. Proximity to nearby developed watershed
Those areas or villages where watershed program has been successfully initiated nearby, such villages are included in the progress so that the progress can be sustained and replicated in further areas.

8. Existence of Active Gram Panchayat and Villagers Cooperation
The Gram Panchayat has an active role in managing the watershed areas because while implementing the program the Panchayat has to help in execution as well as offer it complete support. Moreover in such villages where the Panchayat is dynamic the villagers are also usually proactive and helpful to others.
9. Part of Self Help Groups (SHG) and Savings schemes:
Along with the implementation of the Watershed program, rural people usually remain associated with the Self-help groups which aids in financial savings/loans. This helps them to be financially independent, self-employed and take small loans for income generation activities. These activities are the basic need for the village’s economy.

10. Need of Afforestation
One of the main factors accountable for rainfall is the environment and this is usually dependant on vegetation or forest cover. Thus it is of utmost importance to encourage villages to plant more trees and at the same time refrain from cutting trees. This will greatly help in maintaining the equilibrium of the nature.

11. Receive Technical guidance from NGO’s
In taking the watershed program ahead and developing it further, NGO can play a prominent role in its management. The local NGO’s can help in giving support, mentoring and motivating the people. They also ensure the full-fledged participation of the community in the activities so as to make it more sustainable. Thus the collective conscience, people’s proactive participation and contribution become part of the whole process.
3.9.5. Framework of Watershed Area Development Program:

The framework of Watershed Area Development Program is a very important component in the program’s operation. Just as an artery is important for human body since it is the main carrier of life saving oxygen from the heart to the body organs, similarly the Watershed Program is equally vital for India’s growth. And for this to occur, the smooth administration and monitoring of this program is of paramount importance. This guarantees support and effective management which become the important contributors at every stage of implementation. The framework which is needed for executing the program is narrated below:

The framework of this program is distributed at five levels, which are mentioned below for your reference.

1. Central level
2. State level
3. District level
4. Block level
5. Village or project level

1) Central level:
This program pertaining to rural and agriculture development and improving land productivity is known as Watershed development program. This is being implemented through the Ministry of Rural Development, Government of
India and regulated under its Department of Land Resources. The Minister of Rural Development, Secretary of Rural Development Department and the Committee members formed of experts in this field are in charge at the Central level.

2) State Level:
In order to facilitate the smooth functioning of this program at the State level, there is a Minister of State for Rural Development in place, Secretary of State for Rural Development and the State level Committee formed again of experts. The main objective of this program is to bring about Financial as well as Social revolution and to achieve it community participation is a must.

3) District Level:
At the District level, there is District Rural Development Agency, District Development Officer, Watershed Development Superintendent and an Advisory Committee which has been constituted under the Chairman of District Rural Development Agency (D.R.D.A). They are responsible for the successful execution of the program. This committee finalises the list of blocks of the district where the program would be run and instructs the Taluka Panchayats to take responsibility for the same.

4) Block Level:
The Watershed development team runs the show at the block level. Usually it is formed by the voluntary NGO’s at local level, representatives from the agricultural and forest departments as well as experts from this field who give proper guidance and suggestions in taking it forward. Finally this program has to be implemented in the selected blocks and from the blocks among the selected villages. Thus using the approach from Macro to Micro this program helps the agriculture receive new lease of life, rejuvenates the lands, increases and also maintains the ground water level.

5) Village or Project Level:
At the village level, the Gram Panchayats become the nodal agency for the undertaking of this program and the other main functionaries involved are the local NGO’s. There is also a Committee set up in order to facilitate the implementation process known as the Village Watershed Development
Committee. This committee has around 7 members of which the Talati or Gram Sabha Secretary function as the Secretary for the Committee, 2 women who are part of the Self Help Groups, beneficiaries of the program, one member from the Gram Panchayat, one from the Milk Cooperative Board etc. The formed Committee is functional for a period of two years after which the new members are elected unanimously. They have the onus regarding overall management of the program in the village. With the full-fledged support and assistance of villagers in the scheme they work towards reducing water wastage.

3.9.6. Watershed Program:

1. A watershed is the area of land where all of the water that falls in it and drains off of it goes into the same place. A watershed is an area of land that drains all the streams and rainfall to a common outlet such as the outflow of a reservoir, mouth of a bay, or any point along a stream channel.

2. The projects at the field level shall be implemented by the Watershed Committees under the overall supervision and guidance of Project Implementation Agencies (PIAs).

3. Under this program developing watershed does not mean only the areas of drainage but also includes all the humans, plants and animals that live
in it and all the things we have added to it such as infrastructure or mining or growing crops.

4. The main tasks undertaken through this program is water conservation, be it for irrigation purpose or for farming, creating employment opportunities and improving livestock.

5. The Committee that has been formed under this program is made up of 3–4 beneficiaries, 3-4 members of Self- help groups, 2 members from the Panchayat and 1 from the Watershed Development Team.

6. Usually the Water Development Team comprises of 4 local members who have had educational background in either the sector of farming, animal husbandry, Engineering or Social Sciences.

7. Beneficiaries of this program would mean those who have gained directly from the scheme. E.g. If some people are benefitted by receiving more water for irrigating their farms due to building of lake under this program then they can be counted as direct beneficiaries.

8. Under the Watershed program the project period is for five years.

9. One of the mandatory conditions under this scheme is a 10% contribution towards watershed development fund as per the activities being undertaken in individual lands.
A. Some projects were designed or brought under the Watershed Program over a period of time. They are mentioned below for reference:

a) Drought Prone Areas Programme (D.P.A.P) 1 District (67 blocks)  
b) Desert Development Programme (D.D.P.) 6 Districts (52 blocks)  
c) Integrated Watershed Development Program (I.W.D.P.) Non D.D.P / D.P.A.P.

B. (D.D.P / D.P.A.P.) and I.W.D.P. programs make a list of the villages and blocks that would be included under its umbrella of activities.

C. Under this program as per the following parameters the projects have been granted.

a) In all the projects (micro watershed) the unit of development would be 500 ha.  
b) The whole geographical area would be covered  
c) A provision of Rs 6000/- has been sanctioned per hectare for the arising costs.  
d) As per the five year planning done for the Watershed Development program, various activities and progressive tasks shall be undertaken at different stages.

D. Through the Watershed program, usually the following tasks or activities are carried out:

a) Earth and Moisture Conservation  
   ○ Contour Trenches  
   ○ Culverts/Gully Plugging.  
   ○ Contour Bunding  
   ○ Farm ponds  

b) Tasks under Water Conservation
o Small check dams
o Percolation tanks (small tanks)
o Community Farm ponds
o Well recharging for obtaining potable water

c) Afforestation and agricultural growth

o Afforestation
o Fodder growth/Improve Graze lands
o Planting of trees, medicinal plants and fruit trees
o Promotion/Demonstration regarding new farming methodologies and technologies
o Farm produce, vegetables, fruits processed and storage training
o Drip Irrigation
o Farmstead/Plantation development
o Pest control
o Dissemination of Information

d) Income Generation Activities

o Livestock development/Dairy improvement
o Upgrading Rural artisans Skills
o Vermi compost, Biogas and Bio fertilizer
o Promoting Traditional energy saving devices

e) Organizational Work

o Gram Sabha, Participatory Rural appraisal and Inspirational Tours
o Formation of Self Help groups
o Formation of Beneficiaries groups
o Trainings
o Skill enhancement
o Improving Entrepreneurship skill
f) Prepare list of villages as per priority of the Block
   
o  Acute shortage of drinking water: Height of topographical land
o  Ratio of Scheduled Castes & Tribes population
o  Degrading farm land owing to lack of water
o  Proximity in terms of Distance between the prioritised villages

   The Project Implementation Agencies (P.I.A), comprising of around 3 members is usually assigned 10 to 12 Watershed projects, where each project is having area of around 500 hectares. It is mandatory for them to monitor and supervise these projects.
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<thead>
<tr>
<th>Sr. No.</th>
<th>Queries</th>
<th>Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Since when is the Guidelines of ‘Hariyali’ being applied?</td>
<td>It has been implemented since 1-4-03 (2003-04)</td>
</tr>
<tr>
<td>2</td>
<td>Under the program ‘Hariyali’ who can work as the P.I.A.?</td>
<td>Taluka Panchayat( 1st priority)</td>
</tr>
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<td></td>
<td>District Panchayat( 2nd priority)</td>
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<td>Government depts.( 3rd priority)</td>
</tr>
<tr>
<td>3</td>
<td>What are the main differences in the guidelines of the previous Watershed program and ‘Hariyali’?</td>
<td>The earlier watershed program’s guidelines preferred the local N.G.O’s to function as the P.I.A. whereas under the ‘Hariyali’ program guidelines, Panchayati Raj Institutions are functioning as P.I.A.</td>
</tr>
<tr>
<td>4</td>
<td>How is the P.I.A. formed?</td>
<td>The Taluka Panchayat of the block which has been selected for implementation of ‘Hariyali’ program has to be the P.I.A. If the Taluka Panchayat is not capable enough to take up this responsibility then the other line departments as</td>
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<td>Question</td>
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<tr>
<td>5</td>
<td>Who works at village level of the Hariyali project?</td>
<td>Under the guidance of the Sarpanch, the Gram Panchayat is functioning</td>
</tr>
<tr>
<td>6</td>
<td>Who handles the ‘Hariyali’ project administrative work at the Village level</td>
<td>Gram Panchayat Talati cum Secretary take care of the administrative tasks</td>
</tr>
<tr>
<td>7</td>
<td>At the village level who shall be in charge of the financial transactions of Bank account of ‘Hariyali’ project?</td>
<td>Separate bank account shall be opened for the Watershed Program. Financial transactions shall be done by the Sarpanch or Talati and also through the signatory of the Watershed Development Team who has been appointed by the P.I.A.</td>
</tr>
<tr>
<td>8</td>
<td>What are the responsibilities of the Taluka Panchayat?</td>
<td>The onus of implementation of the project shall rest squarely on the Taluka Panchayat.</td>
</tr>
<tr>
<td>9</td>
<td>The Implementation Committee at the Block level</td>
<td>The Project Implementation Committee shall be created which shall have the Block Development Officer, 2</td>
</tr>
<tr>
<td></td>
<td>elected women members of the Taluka Panchayat, 1 male member of the Taluka Panchayat, Deputy Engineer executive, Veterinary doctor, Agriculture experts, 2 representatives from the N.G.O.’s, Range Forest Officer, Assistant Block Development Officer etc. as its members.</td>
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<tr>
<td><strong>10</strong></td>
<td>The role and responsibility of P.I.C. Committee</td>
<td>The quarterly, half yearly and Annual report regarding the progress review of the project, the evaluation of the work done by the Watershed Development Team and also mentoring and guiding the Gram Panchayat regarding proper execution of the program.</td>
</tr>
<tr>
<td><strong>11</strong></td>
<td>Who shall work under the Watershed Development Team?</td>
<td>The engineer and Gram Sevak of the Taluka Panchayat. If the livestock engineer is not in place, then the lead NGO can hold interviews for the above vacant post through the Taluka Panchayat and hire</td>
</tr>
</tbody>
</table>
them on contractual basis. Staff hired on such basis shall not be deemed as a government employee.

12. At the Rural level, who shall be part of the Watershed Development Committee?
The Sarpanch of Gram Panchayat shall be the President, one Member each from the SSG and User group, one Member from Milk Cooperative, one from Watershed Development Team and the Talati cum Secretary.

13. What would be the role of the watershed Committee at the village level?
The committee will conduct the review about Project performance as well as Financial Review.

14. What is the responsibility of the Gram Sabha?
The Gram Sabha shall be totally accountable for the project implemented at village level.

### 3.9.7. Guidelines for Watershed Development Programs:

1. Under the Watershed Approach three programs are now functioning namely the D.P.A.P., D.D.P. and I.W.D.P and now there is in place common Guidelines for the program. Through the Indian Government, Guidelines have been made and revised at different stages of the program.

1. Watershed Development Program Guidelines – 1995
2. Watershed Development Program Guidelines revised – 2001
I. As per the provisions under the Guidelines brought out in 1995, from the time period of 1995-96 till March 2000 the cost of 500 hectares land which is one micro watershed was Rs 20,00,000 lakhs.

II. 500 hectares of land allocated through the program after 1-4-2000 was priced at Rs 30,00,000 lakhs by the Indian Government.

III. From the total amount of Rs 30,00,000 lakhs, there is provision of Rs 24,00,000 lakhs for various project activities and Rs 3,00,000 lakhs each for administrative costs and trainings as well as for forming community organizations.

IV. As per the provisions made under the ‘Hariyali’ Guidelines in 2003, Rs 25.5 lakhs has been set for civil work, Rs 3 lakhs for administrative work and Rs 1.50 lakhs on trainings and setting up of community organization.

V. Every year around 500 to 750 new projects are sanctioned by the Indian Government.

VI. The new projects are implemented in those blocks which have been cleared by the Indian Government.

VII. The Indian Government has approved, and thus a total of 52 blocks are covered in 6 districts under the D.D.P. program whereas under the D.P.A.P program 67 blocks falling under the jurisdiction of 14 districts are covered. A total of 119 blocks are covered across 20 districts of Gujarat State. Moreover, apart from these blocks, the Integrated Watershed Development Program (I.W.D.P.) also is implemented in Gujarat.

VIII. This project has been sanctioned for a time period of five years by the Indian Government. As per the guidelines of 2001 and ‘Hariyali’ -2003, the time line within which program grants shall be released is 7 weeks and 5 weeks respectively.

IX. Before the ‘Hariyali’ guidelines -2003 was released, the different line departments under the State Governance like G.L.D.C, G.S.R.D.C, Forestry along with NGO’s were eligible for functioning as the Project Implementation Agency (P.I.A.).
X. Whereas as per the ‘Hariyali’ guidelines -2003, the onus of implementing the project now rests on the Panchayati Raj Institutions at various levels. The project cannot be run by the NGO’s as per these guidelines. But in case, the block level Panchayat office and all the other related line departments are found not qualified or capable to function as the PIA, then in such a scenario there is a provision that the local NGO may be awarded a limited role. In such matters, the State Government will have to take immediate necessary steps to make the Panchayati Raj Institutions more self-reliant and develop cohesiveness.

XI. The watershed development program puts a lot of focus on social movement, people participation, community ownership, on formation of community organization and also training activities, training programs, workshops, seminars, motivational tours etc we can take guidance of local NGO’s. this provision has been made in the ‘Hariyali’ guidelines 2003. Para 25
2. D.P.A.P AND D.D.P. PROGRAMS

D.P.A.P. means Drought Prone Areas Program, and its basic objective is to minimise the adverse effects of drought on production of crops and livestock and productivity of land, water and human resources. The programme also aims to promote overall economic development and improving the socio-economic conditions of the disadvantaged sections residing in the programme areas.

The basic object of the Desert Development programme (D.D.P.) is to minimise the adverse effect of drought and control the spread of desert areas by renewal of the resource base of the identified desert areas. The programme endeavours to achieve ecological balance and also aims at promoting overall economic development and improving the socio-economic conditions of the vulnerable populations who are living in the areas.
3. AREAS COVERED THROUGH D.P.A.P. /D.D.P. PROGRAMS:

Under this D.P.A.P program, 67 blocks of 14 districts are reached across in Gujarat State. The names of these districts are listed below for your reference:

1. Ahmedabad
2. Amreli
3. Bhavnagar
4. Junagadh
5. Panchmahal
6. Sabarkantha
7. Vadodara
8. Bharuch
9. Valsad
10. Dang
11. Dahod
12. Rajpipla
13. Porbandar
14. Navsari

The D.D.P. program is being implemented across 52 blocks falling under 6 districts of the State. These districts are listed below for your reference:

1. Banaskantha
2. Patan
3. Kutch
4. Rajkot
5. Jamnagar
6. Surendranagar
4. What is A Watershed and the Parameters in place for area selection

Land and water are ecologically linked in a natural system called a catchment, drainage basin, or watershed. The watershed consists of surface water--lakes, streams, reservoirs, and wetlands--and all the underlying ground water. All the water in that area shall be drained towards one outflow point.

Watershed is a geographical area, wherein all the water within the area covered by watershed is collected and channelling to one common point. Since water flows easily towards a lower elevation point, it gets collected there before joining the other water body. In lay man terms, just like water which easily flows down as slope and collects there at one point similarly the whole area with slope can be termed as Watershed.

In other words, when water flows over one point, all those different geographical areas from where it passed earlier are known as Watershed or Drainage basin. For undertaking Water Management first and foremost the areas are identified using Satellite mapping technology. These area dimensions may be anywhere between 100 hectare to 2000 hectare. In order
to finalize the areas, the geographical maps approved by RISCO and data from Statistical department are referred to pin point the locations based on the following parameters. Preponderance of wastelands/degraded lands, acute scarcity of drinking water, proportion of scheduled castes and tribes, productivity potential of the land etc. Then based on the priority indicators the villages are selected where the project would be implemented. Preference is given to those who can be considered to be the disadvantaged sections on account of economic or social factors e.g. Scheduled castes/ Scheduled tribes, Handicapped and weaker sections. Empowerment of women is given prominence among other parameters. In the selected areas, it is necessary to have 50% of community pasture lands and less than 30% of irrigated land.

5. Development of Watershed Areas

Of the total rainfall that is received in Gujarat, around 46% of water drains away and the remaining 35% is soaked in the ground and increases the moisture content in the soil. 13% of the water percolates into the ground which is also called as infiltration process. The remaining 6% of water accumulates in the dams, rivers and lakes. Thus in order to decrease the amount of water being drained away to the oceans and seas, to minimize soil erosion, increase the water table or ground water sources and bring about increase in vegetation cover watershed areas are developed.
6. Activities covered under the Watershed Development Program:

The types of activities undertaken through the watershed program are vast and varied depending on the emerging needs of the area. Small water harvesting structures such as low-cost farm ponds, nalla bunds, and gully bunds etc. are built which helps in ground water recharge and soil/moisture conservation. To augment the water resources to be used for drinking purposes community wells, desiltation of ponds is carried out. Water harvesting is done by having check dams, insulation techniques, community ponds, farm ponds etc. Afforestation, Nursery raising for fodder, fuel wood all these activities are also carried out. More and above, Animal Husbandry and Dairy development is also given mileage. It also conducts crop demonstrations for popularizing new crops/varieties or innovative management practices, promotion and propagation of non-conventional energy saving devices and energy conservation measures, fisheries development in village tanks/ponds, vermi compost nurseries, bio fuel
plantations like gobar gas, promote activities to increase farm produce, support income generation activities and undertake capacity building exercises to empower the villagers.

7. Selection procedure of Project Implementation Agency:

Under the guidance and advice of the Watershed Development Advisory Committee set up at the District level, the District Governing Board makes the selection of the PIA (Project Implementation Agency) as per the policy guidelines set up by the Government (in effect from 9th May, 2000). After the ‘Hariyali’ program came into effect in 2003-04, the Taluka Panchayats or District Panchayats are usually entrusted with the task of functioning as the Project Implementation Agencies.

8. State level run State Watershed Development Committee:

To ensure coordination among various Government Departments/Institutions and Voluntary Agencies, a State Watershed Development Committee is instituted under the Chairmanship of Additional Chief Secretary /Agricultural Production Commissioner/ Development Commissioner. A designated Department in the State Government is usually
selected as Nodal Department to service this Committee and to supervise the implementation of Watershed Development Programmes. The main role of this Committee is to monitor, review, manage and evaluate the program on regular basis.

9. District Watershed Development Committee:

In order to monitor the competence and quality of the Project Implementing Agency and give them necessary guidance as well as advice at proper intervals, the District Watershed Development Committee has been constituted. It will also be in charge of approving the action plan for watershed development projects in the district. It shall assist in resolving management and administrative problems and guide in implementation of the program.

10. Watershed Development Team At Block level:

Under the Chairmanship of the Taluka Development Officer, in order to work as PIA a special committee is created at the Taluka Panchayat. This Watershed Development Team will be mainly responsible for implementing the project in that block, guide nodal officer/W.D.T mini project
implementation, review of the geographical and financial progress in the program and proposal for fund allocation. Each WDT may handle 10-12 watershed development projects and may have at least five members one each from the disciplines of Forestry / Plant science, Horticulture, Animal sciences, Civil /agricultural engineering and Social sciences. At least one member of the WDT should be a woman. If the Watershed development project is within the jurisdiction of the Gram Panchayat, then the Gram Sabha shall take its responsibility and if it is part of more than one Gram Panchayat, then the Village Committee is registered as per the Society Act 1860, and its beneficiaries who have directly or indirectly gained from the program shall be included.

11. Watershed Committee at Gram Panchayat level:

The Watershed Committee may consist of 10-12 members consisting of amongst the user groups (4-5), self-help groups (3-4), Gram Panchayat (2-3) and a member of the Watershed Development Team. While making nominations, it may be ensured that the Committee has at least one-third representation of women. There should be adequate representation of members from the Scheduled Castes/Scheduled Tribes etc.
As per the ‘Hariyali’ project guidelines, there is a provision of setting up a Development Committee under the Chairmanship of the Sarpanch and with the approval of the Gram Sabha. The members shall be representatives from the User groups and Registered Self Help Groups. This team shall have hands on approach for addressing the program issues. A Watershed Committee shall carry out the day-to-day activities of the Watershed Development Project.

12. Criteria for funding of D.P.A.P and D.D.P. programs:

From 1999-2000 year onwards, all the programs that have been sanctioned through the Central Government, 25% of the total cost shall be borne by the respective state government.

13. Government Approved Funds for the Program & Financial Grants to the P.I.A:

In the first year of the program, a total of 15% of the overall allocated grant is given towards Training, Community Organization, Administrative and for conducting Program activities. In the second and third year, 30% of total grant is released per annum in 2 instalments. In the 4\textsuperscript{th} year and 5\textsuperscript{th} year of the project, 15% and 10% respectively of the grant is released as its 6\textsuperscript{th} and 7\textsuperscript{th} instalments. Release of next instalment is made when the unutilized balance is not more than 50% of the previous instalment released and on receipt of satisfactory progress report and audited statement of accounts of previous year. For this process we need to supplement it with Audit reports, Quarterly reports, and various financial documents like Expenditure and Utilization reports. The Mid-term evaluation is also done after the 4\textsuperscript{th} instalment has been released.

14. Characteristics of the Program:

It is one programme which is making efforts towards the empowerment of the people so that a sense of collective responsibility is
created. This aims for sustainability, people’s participation by involving people & the existing local bodies. When the program implementation is done keeping the user group in the loop and takes into account their suggestions, their priorities in mind then the needs of the local group can be met very effectively. The local community starts taking active participation in the work undertaken by the program and community ownership comes about.

**15. Benefits gained from Program Implementation:**

1. Due to the better facilities provided for irrigation there is total increase in the income levels by 1.74 times. Of this the increase in agricultural income is up by 1.67.
2. Due to better amenities in place for irrigation there is proportional raise in income levels of the farmer levels. The farm labourers and women get employment opportunities and their living standards improve.
3. Local employment opportunities are generated.
4. The village artisans and other workers get sufficient and gainful employment
5. Basic needs of the village like facility of adequate drinking water, fodder, pasture development which means improvement in animal husbandry and growth in Dairy sector.
6. Usage of locally available and low-cost technology and material increases.
7. Awareness level among people goes up.

**16. People’s Participation and Watershed Development Fund:**

In order to develop community ownership of this program the community is asked to bear 10% of the total cost. In case the beneficiaries are from Scheduled Tribes or Scheduled Castes then they have to bear 5% of the total cost. And if they are not able to afford that amount they can return in kind, e.g. by doing some work without charging its labour. The fund reserve collected in this manner is known as the Watershed Development Fund. This
fund shall be utilised in maintenance of assets and property on common land or what is utilized for common use after completion of project period.

17. Watershed Association:

If the watershed is within the jurisdiction of the Village Panchayat, then all the members of the community shall be organized into a Watershed Association after the payment of some nominal fees. If the Watershed project is falling in areas belonging to more than one Panchayat, then members of the Gram Sabha of both villages shall be called upon to form a Watershed Association. When the Watershed Association is formed, care has to be taken to ensure that all members of the community, who are either directly or indirectly dependent upon the watershed area, are being represented in the Watershed Association. It is also ensured that there is representation from the User groups as well as the Self Help Groups in this Association. The Watershed Association has to be duly registered as per the legal norms with the Trust registration Office by paying the stipulated fees. The President of this Association is given the signatory powers to carry out the registration process of the Watershed Association under the Trust Registration Act of 1950 and the Societies Registration Act of 1960.

18. Monitoring and Review of the Watershed Program:

After the project is implemented, its geographical/ area progress as well as financial progress is monitored by reviewing it on monthly, quarterly and annual basis. Apart from this, all the Officers in charge of the watershed program of the various departments associated with this program hold meetings on monthly/annual basis. After the 3rd instalment is released, midterm evaluation is conducted and at the end of the project term the final evaluation is carried out. Thus monitoring is carried at different phases of the program.
1. The P.I.A performance is verified by the Watershed Development Team comprising of members from various sectors like Forestry, Agricultural Animal Husbandry, and Social Sciences etc.

2. At the District level, there is a Multidisciplinary team in place and the Director verifies the work done by the officials who have been assigned the program tasks.

3. At the State level, there is yet another Multidisciplinary team which is in charge of verifying the program activities. Moreover the monthly, quarterly as well as annual progress of the program is reviewed. A panel of Independent Evaluators is appointed to conduct the midterm review after the 3rd instalment has been released and the Final evaluation is done at the end of the Project term.

19. Integrated Wasteland Development Program:

1. This program is implemented in those blocks of the State wherein the D.P.A.P or D.D.P program are not executed, the proportion of wasteland is more and the facilities for irrigation is less than 30%.

2. Attention is given to those areas where 50% is community wastelands and remaining 50% is privately owned irrigable land.

3. This project takes up all the villages that are in the radius of 5000 to 8000 hectare of land.

4. The Government gives priority to those blocks where either the D.P.A.P or D.D.P program is not being implemented.

5. As per the new guidelines, the unit cost for every hectare under the watershed development program is Rs 6000/-.

6. This program is also implemented as per the Guidelines of the Watershed Program.

7. The fixed time frame of the program is of 5 years.
3.9.8. Objectives of Watershed Development Program:

Water plays such a dynamic role in ensuring that biodiversity is maintained in the various life forms present in the world. It is undoubtedly a resource to which the human existence remains totally indebted. Presently this resource is becoming a scarce commodity and it needs to be safe guarded just like other precious metals. In order to help and propagate water conservation there are many programs being implemented. Thus the Watershed Development Program is one of the vital, crucial programs having a people oriented approach. It is making sincere efforts towards people empowerment so that a sense of collective responsibility can be brought about.

The objectives of this program which is implemented through the Government in the different states are mentioned below:

Training:

Capacity building is a very essential component for the Officials of the Watershed Development Program and Development Team members, so as to get thorough technical know-how and organizational aspects about the program implementation aspects. The reason for this is that the program’s success and efficacy ratio depends on the methodology employed in project implementation. Thus the training arrangement for the functionaries and also stakeholders in charge of the Watershed development program’s implementation is done simultaneously. The training is imparted at the Development Support Centre, Ahmedabad which facilitates and also provides technical support. The whole training schedule is divided in two phases. The training mainly encompasses the rural scenario basic but critical issues.

1. In order to increase the Efficacy and have sustainable production in the agricultural land or farms, the land needs to be protected or maintained.
The land should be made more productive by taking the proper precautions and care.

2. Conserve and protect the natural resources of water and make efforts to increase the same.

3. To regulate the occurrence of floods and decrease the silt deposit that occurs in the lakes.

4. Increase irrigation and for taking harvest of crops use the conserved rain water thus reducing chances of drought.

5. In order to improve the various occupations and industries associated with farming/agriculture encourage the use of local and traditional resources available. This shall cause a positive change in the socio-economic status of the community people.

6. In order to curb the amount of runoff water and increase soil moisture, take proper measures for the same.

7. Encourage people’s participation and inculcate community ownership and sense of collective responsibility.

8. Generate employment opportunities so that it benefits the economically weaker sections in the community.

9. Inculcate the habit of savings among the community members.


11. Maintain and conserve common property resources or assets.

During the course of this training the participants are divided into teams and each team is the responsibility of recapitulating the points covered each day and preparing the reports. Topics are carefully chosen based on how integral they are to a farmer in his daily life e.g. Beneficial in Agriculture, water conservation etc. The trainees are made conscious regarding the concept of people’s participation, its significance and through utilization of community mobilization address all emerging needs as well as issues. This motivates the community further to start Self Help groups.
Whether it is the Watershed Development Program implementation or the training of the various functionaries regarding Implementation, the key factors to be noted are People’s support and Coordination. Be it any village issue, either Health related, or building roads, or schools, or regarding water conservation it cannot be solved without active participation from the community. Participatory Rural Appraisal (PRA) methodology is also intensively used in the program implementation which increases community ownership in the program and this in turn ensures sustainable development and conservation of resources.

3.9.9. People’s Participation in Watershed Development Program:

The involvement of Primary Stakeholders in this Watershed Development Program is one of the fundamental principles of this program’s implementation. Since this program aims at creating an ecological balance between natural resources and human resources the role of the Community in the program implementation is a must.

The main features of the Participatory Rural Appraisal which is used for implementation of the program are listed below:

1. Interact with the local villagers or community to understand the issues as well as the situation and then plan along with them to analyse and reach the solutions.

2. Once we take the community through this exercise the people shall start taking part in various activities independently.

3. Through the PRA exercise, people’s expectations, attitude, behaviour and the solutions to their issues, or problems are realized.

4. Under this program apart from the expected outcomes other new information is also gained or received.

5. Due to the PRA exercise, people become directly or indirectly associated with other.
Participatory Rural Appraisal (PRA):

Till decades, various development programs would be initiated by the Government at either Delhi or Gandhinagar. The State machinery would implement these “readymade” programs among the community, other leaders would take these programs so as to gain from the financial subsidy offered but were not successful. These programs were no doubt meant for the people, but it was not by and of the people. So these programs did not run for longer time periods.

The programs become successful only when people think of it as their own program. The methodology of Participatory Rural Appraisal (PRA) works very well in such approaches. It is based on the ideology that the community people know best about their own situations. The chances of their issues being resolved or mitigated and its priority among other issues can be properly judged only by the community itself.

Some of the important points regarding successful application of Participatory Rural Appraisal are written down for your reference:

1. Earlier the development programs were in a very structured and comprehensive format when implemented in the community. But when the program content is presented to the community in a draft form, and is open to their suggestions, views and comments based on their experiences, the final shape of the program derived in this manner; this is the basic concept of PRA exercise.

2. People can use their wisdom, knowledge, thoughts without any inhibitions or fear of being ridiculed when a conducive environment is provided. The watershed development program functionaries want to know more from the community, want to understand from the community. Differences in the socio, economic, cultural and educational lifestyle racism prejudice social and cultural identities
At the start, the functionaries have to learn from the community. They are the students and community teaches them. After observing and understanding true picture in the community only then can the functionary add on to the program his view points and experience. Thus there is lot of interdependency and change of roles in the process and here the PRA methodology is of importance. Thus Participatory Rural Appraisal( P.R.A.) can also be rightly called as P.R.L where the alphabet L stands for learning since many new concepts and ideas are learnt in this program.

3. If we consider opinions of only the village representatives, or the leaders, or those men who attend meetings then such community responses are bound to be either prejudiced or biased. When the community responses also comes from the farmer who works on his field, the farmer who grazes his animals, the men, the women and villagers it can be considered as the true picture. All their wisdom, knowledge and understanding which are of paramount importance can be utilized for the benefit of the community. The watershed program people need to interact with the community persons at the right place, right time and at their convenience. It has to be ensured that the people continue to show their interest and involvement under the PRA exercise. This can only be possible when the program functionaries take interest in whatever the community is involved in, their tasks, win over their confidence and trust. Only then will they be comfortable with us.

4. PRA is a very useful tool. But the most important factor is the officials’ and their selfs. They should have the knack of winning over the minds and hearts of the rural community and be able to create such a positive environment where there is no inhibition or fear. The methods of P.R.A. need not be always followed rigidly and at certain times based on the emerging situations in the area, it can be modified. One of the objectives of PRA technique is to make the local community much easier for the officials or outsiders to understand.
5. Under the PRA exercise one has to maintain very cordial and friendly relations with the community. Due to such an approach initially there may be scepticism among the villagers regarding the purpose of the program and why it is needed. In such a scenario it is necessary for the officials to explain the program in great detail.

6. Under this program there is a lot to know and learn. But at the same time we should realize that it is more important that rather than use all the methods to learn, we should take each method one by one and try to acquaint the villagers with the nuances. If we hurry with the methods they will find it confusing or difficult and lose interest. Or else the second approach can be to take the most important and relevant topics in discussion rather than all the points which may not be of any purpose. It is not very advisable to complete the questionnaire just for the sake of it. The R in P.R.A (Participatory Rural Appraisal) can be also used for Relaxation in the words of Robert Chamber which is the way the sessions should be addressed and taken ahead. During the various activities like preparing social Maps & tables it is imperative to check the understanding of the community regarding the concepts. When the group is conceptually clear and start the activity with clarity, then the functionary need not be with the group to guide them at all times. Later if it is observed that the group is competent and has the potential to complete the tasks given independently, in such a case the officials should let them progress on their own and move on to other responsibilities.

7. There is no need to maintain very accurate and detailed information. A more practical approach would be to see and know the general outlook of the community and make plans accordingly. To take an example, if we want to find out since when are the water level in wells going down, how fast is the level depleting. For this we just need to know in which part of the village this problem is more aggravated and based on that we can immediately make plans for water conservation. There is no need to
know how many centimetres of water levels are decreasing each year in the wells.

8. In our society there is no dearth of either wisdom or knowledge. It can be on various topics like trees, vegetation, animals, water and similarly there are different resource persons or technical experts on varied topics. If we have to learn something new, we need to go to that expert. The villagers may not have the confidence or the skills to speak on a particular topic with others but it can be cultivated in them. This is true especially in the case of economically deprived sections or women members.

9. Learning also happens when we listen carefully. And we should keep this aspect firmly in mind when we are in the rural areas. In a village, a knowledgeable person will usually hesitate to speak in a group at the start. So we should not disturb or make him conscious by interfering in between. Our role should be more of a facilitator and that of a motivator.

10. In the PRA exercise the representatives of the program should definitely know all the components about the program and this is highlighted very well in either questionnaire format or checklist for their reference.

11. In the Participatory form of Development program the functionary should very receptive to learning new things from various sources. Keep all his senses open: eyes, mind, ear, nose, skin, tongue.

**3.9.10 Watershed: Planning and Implementation Phase:**

The watershed program is a basic need for the development of Rural areas and thus its Planning and Implementation phase is very critical:

1. To decide the program’s specific objectives as well as goals.
2. Make a list of the available natural resources like water, land, vegetation and animals and conduct survey of the same.
3. To find out the quality and regarding use of resources
4. Documentation of the views of the community and their knowledge regarding the uses and coordination of natural resources.
5. The problems arising due to erosion of natural resources, types of erosion, effects of erosion and evaluation of the community needs.
6. Involvement of village communities, local NGO’s and experts
7. Strategically Developed programs, options and technological capsule
8. Demonstrating people’s knowledge of technology used and other options applicable.
9. Community selection of choices or options
10. Implementation, monitoring, conservation, participation and decision making process: the developing of institutional mechanism for the same
11. Program’s observations/conceptions
12. Review of the program and modifications as per need
13. Program’s overall monitoring and evaluation

The transformation of rural areas has become possible with the implementation of this Watershed program. The criteria and principles responsible for its success are mentioned below:

1. Activities and other project tasks should be completed as per the sanctioned sections and standards within the stipulated time frame of the program.
2. There should be significant increase observed in the agricultural produce.
3. Against the financial targets, there should be satisfactory achievement visible.
4. The outcome of the various activities undertaken through this program should be clearly observed.
5. Of the total work completed, 80% at least should have been completed by the user groups themselves.
6. The people should have adopted as impact of this program the measures like afforestation, animal husbandry, horticulture etc.
7. In the completed work there should be a ratio of 60:40 maintained at all times for emerging labour costs.
8. Of the total area, 80% of area should have been treated or covered under the program.

3.9.11 Main Activities of the Watershed Development Program:

The rural development and transformation depends a lot to the successful implementation of the Integrated Watershed Development
Program. A lot of rural centric activities like farming, agriculture, animal husbandry, health & sanitation and construction depend on water accessibility. Thus the Watershed Development Program is executed in the villages after getting a commitment from the community regarding its participation in the implementation process. The main activities carried out under the program are shown below:

<table>
<thead>
<tr>
<th>Water Conservation</th>
<th>Soil Conservation</th>
<th>Agricultural Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small check dams</td>
<td>Contour Bunding</td>
<td>Crops demonstration plots</td>
</tr>
<tr>
<td>Big check dams</td>
<td>Embankments</td>
<td>Fodder demonstrations</td>
</tr>
<tr>
<td>Insulated ponds</td>
<td>Gully plugs</td>
<td>Kitchen Garden</td>
</tr>
<tr>
<td>Soak pits</td>
<td>Terracing</td>
<td>Ayurvedic demonstrations</td>
</tr>
<tr>
<td>Farm ponds</td>
<td>Naala Bunding</td>
<td>Vermi compost</td>
</tr>
<tr>
<td>Well recharging</td>
<td>Gabion</td>
<td>Horticulture demonstration</td>
</tr>
<tr>
<td>Bori Bund</td>
<td></td>
<td>Land levelling</td>
</tr>
<tr>
<td>Naala plugging</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>For Environmental Development</th>
<th>Animal husbandry</th>
<th>Management Training</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deworming</td>
<td></td>
</tr>
<tr>
<td>4. Agro Forestry</td>
<td>4. Silage</td>
<td>4. Film Show</td>
</tr>
<tr>
<td>5. Live Fencing</td>
<td>5. Urea Treatment</td>
<td>5. Awareness camps</td>
</tr>
<tr>
<td>6. Farm forestry</td>
<td></td>
<td>6. Group formation</td>
</tr>
<tr>
<td>7. Fodder improvement</td>
<td></td>
<td>7. Motivational walks</td>
</tr>
<tr>
<td>8. Silvi Pastoral</td>
<td></td>
<td>8. Meetings</td>
</tr>
</tbody>
</table>
All the activities mentioned above are in some or the other way connected or interlinked with rural development. For e.g. Animal husbandry, farming, horticulture and pasture lands development rests on the accessibility to water and for that the Watershed development program is implemented. Thus it can be also said that all these activities are subsequent to the success of the Watershed program.

3.9.12. Watershed Program’s various steps:

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Selection of the village</td>
</tr>
<tr>
<td>2</td>
<td>Primary survey</td>
</tr>
<tr>
<td>3</td>
<td>Selection of Watershed area</td>
</tr>
<tr>
<td>4</td>
<td>Gram Sabha group formation</td>
</tr>
<tr>
<td>5</td>
<td>Formation of Watershed Association and Committee</td>
</tr>
<tr>
<td>6</td>
<td>President, Secretary and Volunteers Appointment</td>
</tr>
<tr>
<td>7</td>
<td>Registration and Opening Bank Account</td>
</tr>
<tr>
<td>8</td>
<td>Participatory Rural Appraisal</td>
</tr>
<tr>
<td>9</td>
<td>Sanctioning of Project</td>
</tr>
<tr>
<td>10</td>
<td>Various training organizations programs/activities</td>
</tr>
<tr>
<td>11</td>
<td>Implementation through People’s Participation</td>
</tr>
<tr>
<td>12</td>
<td>Equal distribution of work/tasks</td>
</tr>
<tr>
<td>13</td>
<td>Handing over of the project, sustainability</td>
</tr>
<tr>
<td>14</td>
<td>Benefits for all</td>
</tr>
</tbody>
</table>

3.9.13. Watershed Development Program’s Implementation Success:

The basic criterion which is responsible for the success of the Watershed Development program is mentioned below:

Since the rural development programs bring about growth and prosperity to the areas where they are applied, people are usually proactive. This program’s success ratio is dependent on the people’s contribution and people’s participation.

The government officials in charge of the rural development program offer their support and guidance for proper planning as well as execution of the program.
The activities undertaken in this program are easy, simple, and resourceful as well as economically viable that other economic activities can also be planned from the same sanctioned budget.

The activities started under this program are taken care of and also sustained by the community themselves so that better coordination can be maintained.

Any issues cropping up during the implementation phase is tackled by the community people themselves and this ensures that the project execution happens without any hassles.

Equal distribution of profits is done among the different groups so that no one feels discriminated against.

After taking into account the village’s water, land, jungle or vegetation, animals and population, such activities are initiated which increase production and boost the village economy.

The newly formed organizations like the women self-help groups are facilitated so that they continue to function and do not close down.

Specific and meticulous Planning is conducted such that farmers get adequate water supply for irrigation not only for the whole year but also for extra two months. This ensures that the locals get employment opportunities till the time farming activities are on-going in the village.

When the water conservation techniques are used in different methods as per the area then it works better. For e.g. water conserved from water sources within the village area is used for various household activities whereas the water conserved at the outskirts of the village are brought in use for irrigation of crops. Thus any issues pertaining to crops or regarding employment can be resolved in this manner easily.

As per the evaluation of the Watershed development program which had been implemented at Rajkot, it is easily marked that the strength of this project lies in its simplicity. Through the Rajkot district Development Agency sponsorship, 12 watershed development programs in 10 villages under the Maliya block constituency since the year 2001- 2002 soon after the region had been hit by an earthquake. During the start-up phase, in each village
gram sabha meetings, awareness programs and film shows were organized so that people would get to know about the benefits of watershed development program. Initially people were not interested in contributing towards the program nor interested in doing any manual work. But due to the continuous efforts put in by the NGO, and regular training programs held for community organization formation, partial success was gained in first year of implementation. In the first year, some watershed activities could be carried out like building water conservation structures like village ponds, farm ponds, check dams etc. and from that the farmers could irrigate their crops that year. As a result crop production increased and the next year this program got an impetus and people also started giving more than the mandatory 10% of contribution to the program activities.

Under the watershed program after the training on community organization and E.P.A. process is done, the various activities were taken in hand like water and land conservation, environmental growth, animal husbandry. The milestones of the success of the program are written below:

**Pilot study level activities:**

After the work related to Community organization, trainings and Entry Point Activity (E.P.A.) is completed, the watershed development program takes up the responsibilities for water as well as land conservation, trainings, farming, environmental growth and animal husbandry. These activities are herewith mentioned:
### A. Land/Water Conservation

<table>
<thead>
<tr>
<th>Item</th>
<th>Acquired no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check dams</td>
<td>169</td>
</tr>
<tr>
<td>Farm Ponds</td>
<td>101</td>
</tr>
<tr>
<td>Naala Bunding</td>
<td>83</td>
</tr>
<tr>
<td>Wells recharging</td>
<td>63</td>
</tr>
<tr>
<td>Compost structure</td>
<td>05</td>
</tr>
<tr>
<td>Bori bunds</td>
<td>55</td>
</tr>
<tr>
<td>Cause ways cum check dams</td>
<td>07</td>
</tr>
<tr>
<td>Water harvesting tanks</td>
<td>07</td>
</tr>
</tbody>
</table>

### B. Farming Development

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farming embankments/bunds</td>
<td>18000 mts.</td>
</tr>
<tr>
<td>Waste weirs of Farms</td>
<td>38</td>
</tr>
<tr>
<td>Kitchen Garden (Plot)</td>
<td>246</td>
</tr>
</tbody>
</table>

### C. Environmental Development

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horticulture plantation</td>
<td>20226 plants</td>
</tr>
<tr>
<td>Gram Vatika</td>
<td>20 hectares</td>
</tr>
<tr>
<td>Agro forestry plantation</td>
<td>49700</td>
</tr>
<tr>
<td>Livestock growth</td>
<td></td>
</tr>
<tr>
<td>De-worming</td>
<td>6100 dose</td>
</tr>
<tr>
<td>Vaccination</td>
<td>6900 dose</td>
</tr>
<tr>
<td>Veterinary Camps</td>
<td>33 camps</td>
</tr>
<tr>
<td>Mineral Powder Kg.</td>
<td>3000 kgs.</td>
</tr>
<tr>
<td>Employment Generation</td>
<td>Work days</td>
</tr>
<tr>
<td>Category</td>
<td>Number</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>S.C.</td>
<td>28392</td>
</tr>
<tr>
<td>S.T.</td>
<td>452</td>
</tr>
<tr>
<td>Baxi Panch</td>
<td>3057</td>
</tr>
<tr>
<td>Others</td>
<td>17053</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>48954</strong></td>
</tr>
</tbody>
</table>

**Family wise**

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.C.</td>
<td>1160</td>
</tr>
<tr>
<td>S.T.</td>
<td>20</td>
</tr>
<tr>
<td>Baxi Panch</td>
<td>1224</td>
</tr>
<tr>
<td>Others</td>
<td>6957</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9361 families</strong></td>
</tr>
</tbody>
</table>

9361 families have benefitted from this service.

**Farmers wise**

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Income farmers</td>
<td>2174</td>
</tr>
<tr>
<td>Middle Income farmers</td>
<td>248</td>
</tr>
<tr>
<td>Low Income farmers</td>
<td>3250</td>
</tr>
<tr>
<td>Farm labourers</td>
<td>1519</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9361 farming families</strong></td>
</tr>
</tbody>
</table>

9361 farming families have taken benefits of this scheme.
Effectiveness of Watershed Program:

Through I.W.D.P program, the villages implementing this scheme have gained a lot. As mentioned below, in total of 12 projects we can see the positive effects.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Particulars</th>
<th>Before Watershed program initiation</th>
<th>After Watershed program was initiated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Water levels in wells</td>
<td>Monsoon 20 feet</td>
<td>Monsoon 60 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Winters 10 feet</td>
<td>Winters 35 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Summers 05 feet</td>
<td>Summers 10 feet</td>
</tr>
<tr>
<td>2</td>
<td>Irrigation areas winter</td>
<td>300 hectares</td>
<td>2880 hectares</td>
</tr>
<tr>
<td>3</td>
<td>Farming crops</td>
<td>No farming during monsoon</td>
<td>Kharif Ravi crops grows</td>
</tr>
<tr>
<td>4</td>
<td>Migration( no of families)</td>
<td>960</td>
<td>180</td>
</tr>
<tr>
<td>5</td>
<td>Wages ( per person)</td>
<td>50/-</td>
<td>100/-</td>
</tr>
<tr>
<td>6</td>
<td>Farming income ( in rupees)</td>
<td>24000 hectares</td>
<td>60000 hectares</td>
</tr>
<tr>
<td>7</td>
<td>Paucity of drinking water</td>
<td>During summers generally available</td>
<td>Daily available on regular basis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>during the day</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Number of livestock</td>
<td>4200</td>
<td>5952</td>
</tr>
<tr>
<td>9</td>
<td>Milk production (estimate)</td>
<td>3 litres/per animal/day</td>
<td>6 litres/per animal/day</td>
</tr>
<tr>
<td>10</td>
<td>Ratio of school drop outs</td>
<td>30%</td>
<td>20%</td>
</tr>
<tr>
<td>11</td>
<td>Bank Loans</td>
<td>420 lakhs</td>
<td>480 lakhs/ for irrigational purposes</td>
</tr>
<tr>
<td></td>
<td>Loan recovery</td>
<td>50%</td>
<td>80%</td>
</tr>
<tr>
<td>---</td>
<td>---------------</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>13</td>
<td>People’s Participation</td>
<td>Very less participation</td>
<td>Very good participation</td>
</tr>
<tr>
<td>14</td>
<td>People’s attitude</td>
<td>Less helping</td>
<td>Very helpful and open for new technological ideas</td>
</tr>
<tr>
<td>15</td>
<td>Water tankers during Summers</td>
<td>36 tankers</td>
<td>Now no tankers are needed</td>
</tr>
</tbody>
</table>

2.9.14 Watershed Development Program Implementation’s Administrative Aspects:

Sanction Process at D.R.D.A.

From the village level, once the proposal receives approval of the Gram Sabha, it is sent across to the D.R.D.A.

District Rural Development Agency studies this proposal for any technical shortcomings, if any, and later forwards it to the Advisory Committee for its approval.

Periodically, monitoring is done to ensure that the procedures being followed are in line with the approved planning.

Resolutions of the Committee Meetings:

The tasks at the village level are carried out in tandem with the D.R.D.A.’s approval of the technical and administrative aspects of the project. But before these approved tasks can be applied in the village, it is mandatory for the Committee to hold monthly meetings in order to review these planned tasks and pass resolution on the same. The task distribution to each beneficiary under the program is discussed at length.

As per the consent/application letter received from the user group, the Committee gives its approval of tasks after thorough discussion.

Quotations:

The material and services that is needed for completion of the approved tasks is purchased through the quotation process. In this, vendors
are asked to submit their prices on specific products or services. The number of vendors submitting their rates should be at least three, offering same type of material or service and from them the best one in terms of quality and economical price is selected. The Committee finalizes the supplier by passing a resolution. Later the supplier has to give a letter of consent stating that the terms mentioned in the quotation are final and it may be considered as the contractual terms of the purchase. Once the time specified in the quotation is over, then again the process is carried out.

After the quotations are approved of by the Committee the purchases are made.

**Technical Supervision and Scaling:**

When any task is being implemented, it is important to carry out quality checks frequently and confirm that the material used is of good standards. In this regard, guidance is taken of local leaders, user group members, P.I.A. team members and regular visits undertaken by the engineer to ensure that work is being properly implemented. This kind of regular technical supervision guarantees that quality work is carried out. Moreover for the tasks that have been completed, it is necessary to measure the amount of work done. And in this the presence of local leaders, user group members as well as President and Secretary is an added benefit.

**Payment:**

As per the measurement of the work accomplished, due payments are released as per the sanctioned procedures in place. It is required that certain norms are followed in order to propagate transparency in financial transactions. Thus payments are always required to be made via Account Payee cheques. The payment vouchers should have the authorised signatures of both the Project Leader and the President/Secretary. It should be ensured that the concerned vendor gives a receipt for the same.

**Stock:**

Whatever materials are being purchased, it is regularly being received and issued or dispatched towards the various jobs in hand. This information has to be properly maintained in the stock inventory. It is imperative that
while issuing payments, the amount of work done is corresponding totally with the quantity of material spent for the same. Whenever any material is giving to a beneficiary on individual basis, it is required to note the details along with his signature without fail.

**Labour work:**

Wherever labourers are required as per the nature of the job, in such areas the attendance register is mandatory. As per the amount of work the number of labour task force assigned should be as per the provisions in the program. Moreover in those cases where the overall work has been given to one individual, accordingly the wages shall be correspondingly calculated. Payment shall be done on regular basis.

**People’s Participation:**

It is required that whatever contribution has to be taken from the people it has to be done within the stipulated time line as specified in the guidelines and also as per the instructions of the District Rural Development Agency. Receipts have to be issued against those contributions collected from the people. This monetary amount is deposited in the bank on periodically and the receipts have to be retained safely.

The contributions could be in any form: either as labour work, materials or monetary in nature. But the documents of the same should be well maintained and updated at all times.

At the P.I.A and the Committee level, it is requisite to maintain proper documentation by keeping proper records. These may include income-expenditure expenses, stock, labour, people’s contribution etc. which need to be updated at all times.

The President, Secretary and also the villagers should be well acquainted with the various administrative tasks and procedures followed under the program. So there is a dire need to develop their capacity building in these areas. It is thus required that a competent representative from the P.I.A. is selected along with the Secretary of the Committee to undergo training on recording keeping aspects.
For the completed tasks, the Committees and Gram Sabha have to give their approval on periodical basis.

At the end of the fiscal year, the expenditure is audited by the Chartered Accountant and the D.R.D.A auditor. This audit report is submitted to the D.R.D.A’s office and the Charity Committee’s office. As per the specified timelines given, regular audit reports for the said period is done and this process is completed at the P.I.A and the Committee level itself.

2.9.15 Maintenance and Managing Operations:

It is the responsibility of the user groups and the community organizations to maintain and care for the various structures or assets built under this program. When any of the constructions are in need of minor repairs the user groups can decide among themselves the course of action to be taken. But if any structure needs major repairs to be carried out, then after getting the estimates of the cost, it would be approved in the Committee by passing a resolution. The cost can also been borne by raising funds through donors or view other fund sources by applying for aid in some other government departments.

The user groups and social organizations have the additional responsibility of ensuring that the ready structures built are protected and safe guarded against any kind of harm or destruction. If need be, they can also have the Gram Sabha pass a resolution and fix the amount to be paid as fine if someone does cause harm to the assets.

Linkages should be strengthened with the other departments like Agriculture Universities, Animal Husbandry, Irrigation, Horticulture, Health etc. so that they remain updated with the latest data and information. Moreover the villagers can also benefit by knowing about the new schemes that have been introduced in the government sector. If any dispute or clash occurs due to difference in opinions or beliefs it shall be resolved by the village leaders.

1. The benefits of the newly created assets shall be properly distributed among the beneficiaries as per the standards mentioned in the program. For example if a dam has been newly built, water shall be
distributed to the people after first ensuring that proper mechanisms are in place.

2. Any produce that is grown in the common pasture areas of the village shall be distributed among the Self Help groups and the User groups as per the provisions mentioned in the program. E.g. Fodder, fruits, vegetables etc.

3. Of the extra profits or produce gained from the newly created assets some amount can be put aside to create revolving funds. This can be utilised for the community benefit later on. It is desirable that the community organizations implement these.

The provisions in place for making Check dams, De silting of ponds and equal distribution of profits should be clearly stated in the resolution passed by the Committee. If need be, it can be made chargeable and the amount can be deposited in the development funds generated.

**Evaluation:**

Evaluation is the study to check if the set goal and objectives of the program are being completed within the stipulated timelines.

It is very crucial to frequently verify if the Watershed Program activities are progressing as per the action plan and meeting the set quality standards. It is equally essential to check the direction in which the program is heading and also the pace at which it is progressing. One should also verify if the desired goals and objectives are being realized at the correct time. So at proper intervals the evaluation process should be carried out.

There are two types of evaluations processes:

1. **Internal Evaluation**
2. **External Evaluation**

1. **Internal Evaluation:** It is appropriate if such an evaluation is conducted by the village leaders. Guidance can also be got from the team members.
2. External Evaluation: This type of evaluation is usually carried out by an independent agency or individual. They will verify if the program is being successful accomplished against the set parameters or criteria.

Criteria for Achievement:

Each Watershed shall have varying ground realities and situations. Keeping this factor in mind, minimum standards have been fixed to assess the program in order to evaluate the success of work already done.

1. Achievement criteria for Technical work

For aiding Land conservation, significant measures like Contour Bunding, Gully plugging, Naala Bunding, Embankments should have been undertaken.

In the Watershed area, after water recharging has been completed, the optimal utilization of water is done and adequate work has been done to arrest soil erosion.

Attempts have been made to increase the productivity of the land by continuously working and applying treatment measures on the land during the year.

During the Project’s implementation, care has been taken to ensure that geographical and financial targets have been met satisfactorily. The 60:40 ratios between the labour cost and the material is maintained and employment opportunities has been generated.

The factors enabling the production of Fuel wood, timber, fodder, food grains and forest production is being specifically considered and accordingly plans are made.

2. Achievement criteria for Implementation:

Of the total area under Watershed program, 80% has to be at least under treatment for land as well as soil conservation. Of the total work or activities taken up, 80% should have been supervised or overseen by the user groups.

Of the activities taken up, of them 80% should have been completed within specified time frame and also within the sanctioned budget. It should have good quality in line with the technical design.
Crops, afforestation, Horticulture, Animal Husbandry activities like these should have adopted/experimented new technology measures. Of the total new methodologies tried out, 50% should have been done by the user groups. 80% of the jobs completed should be beneficial for the whole community at large.

The user groups also are willing to take responsibility for managing and maintaining the varied social tasks.

3. Achievement criteria for Self Help Groups

Of the total number of self-help group members, 505 are also part of the community organizations formed. Cattle breeders or livestock farmers, farm labourers, Scheduled caste and Scheduled tribes and women shall make 5 to 10 Self Help Groups separately.

The groups shall meet once or twice in a month. The group members shall have discussions on common areas of interest or issues and take decisions amicably.

The Self-help group members help build up the financial resources by being involved in various Income generation activities. The accounts related documents are updated regularly and well maintained.

4. Achievement criteria for User/ Beneficiaries Groups

50% of the people who are benefitting from the watershed activities and belong to the user groups should also be part of the Watershed association that is formed.

The user groups should independently address at least 80% of watershed development tasks. The group members shall meet once in a month to discuss relevant issues. In case of any disputes or conflict arising in the meeting, the beneficiaries group shall try to amicably work it out and reach a consensus or decision.

Around 10 to 50% of them are ready to contribute towards the activities carried out under this program. They are giving their support to the Watershed Development Committee which is working on tasks aiming at village progress.
The responsibility of managing and maintaining the different treatment procedures done through the program is accepted by all the group members and does not lie with any one individual.

**Benefits of Work undertaken and its Effectiveness:**

If we have to check the effectiveness of the program, and see if the projected objectives are being met or not, the results acquired after studying the program should be mentioned clearly in the reports. This has to include the data since the beginning of the program till the end. And season wise survey, collection of all information and data analysis is quite crucial. For this different types of survey is conducted plus the information regarding the beneficiaries is also maintained.

In order to conduct in depth study and exhaustive or detailed reports it is important to fill details and analyse the findings. In order to get the information needed in the forms, it is important that the representation of all the groups happen from across the village. Keeping these criteria in mind a group of 15 to 20 persons belonging to various sections are interviewed and their details are filled up in the forms. Moreover particular details could also be got by conducting P.R.A. techniques in the village. This allows us to study the benefits or pros and cons of the program even after the project term is over.

**Exit Protocol:**

After the completion of the Watershed program, there is an Exit Protocol agreement in place which mainly specifies the mechanism for maintaining the created assets, equal distribution of benefits as well as its sustainability, utilization of the watershed development fund and overall expansion.
Project Information:


2. Year

3. Year of Completion

4. Village Block District

5. Area Code No. Area( hectares)

This agreement is entered _____________ in the_________ month dated _____________. First party is the ________ Panchayat which has been legally formed under the 1961 Gujarat Panchayat Act, for________ district’s________ block’s village. (Here after) shall be termed as Panchayat in this contract. Apart from this, it shall also mean the WASMO officials in charge of the said village and the assignees. The second party is the Gujarat State’s Governor, here after called as the Government. In this reference, unless mentioned otherwise, this term shall also be inclusive of their successors (in terms of post), designated officials and assignees. And the other party is the Project Implementation Agency (P.I.A.) here after known as the Organization in this context unless mentioned otherwise; it shall also include the successors, designated officials and assignees. This agreement is among all these above mentioned parties. As mentioned in the schedule 1, the created community assets like pasture lands, river, channels or heath areas shall be entrusted to the Panchayat. These assets are directly or indirectly profitable to village community. The Government hands over the responsibility of these assets to the Panchayat and as mentioned in Schedule 2 the funds deposited in the Watershed Development Funds shall be utilised in maintenance of assets and regular augmentation growth Thus now there is a contractual agreement done among all the parties involved and the clauses are mentioned below.
1. As per the provisions mentioned in the Watershed Development Program guidelines, once the project term is over, for the future development of the watershed areas the respective Watershed Associations, Watershed Committees, user groups and long-lasting natural resources: all these activities are under the overall supervision of the Gram Panchayat. The Gram Panchayat has total right over the various activities of the watershed.

2. The profits gained from the Community assets should follow the principle that has been specified in the project guidelines. It states Equity and sustainability of the assets created under the Watershed program. Thus all the community members covered under the Watershed program are to be treated equally, ensure that profits are distributed evenly and special consideration is to be given to people living below poverty line, SC and ST castes etc. These vulnerable people also should be linked up with other government schemes where they are entitled to get some benefits.

3. Landless people and people belonging to weaker sections of the community also hold equal rights over the use of natural resources like water, fodder, jungle produce, and this distribution of equal rights and facilities are important provisions included in the Panchayat resolutions.

4. Regarding Community ownership of natural sources the law pertaining to the land allows the methodologies selected by the watershed committees. After gaining approval from the Gram Sabha these procedures shall be applied in the field by the committee members as well as user groups.

5. Along with the tenure of the Watershed Development Program, the Program Implementation Agency (P.I.A.) technical role is also over. But in future if there are any disputes or misunderstanding arising regarding the various treatment works carried out or their duties under the Watershed program, then it shall be held responsible.
2.9.16. Technical Planning:

**Contour Trench/ Staggered Trench**

Staggered Trenches are built in places characterized with steeper slopes, more rainfall and where the land is having uneven surfaces. The length of the staggered contour trenches is based on the characteristics of land and it could be anywhere between 3 to 8 meters while the breadth is around 0.60 to 0.90 meters and depth or height is 0.30 meters.

The gap between two trenches is decided on the basis of the slope and the amount of rainfall received in the area. Moreover adjustments are made in such a manner that the third trench below is built in the space between the two trenches.

The survey for deciding the placement of the staggered trenches uses A Frame contour mark level tube, line level or a Hydro-marker level to measure the slopes as well as contours.

**Contour Bunding/ Contour embankments**

This soil conservation structure is recommended for slopes less than 6%, where the rainfall is medium and the landform is largely plain or leveled. Contour ditches are built as horizontal ditches along the contour in order to prevent water runoff.

The length of a contour ditch is like horizontal ditches put together consecutively. The breadth of the trench is in between 0.60 to 0.90 meters and the depth is around 0.30 meters. The distance between two ditches is based on the hydraulic design.

For such conservation structure the type of topography best suited for its effectiveness is dry land, flat terrain or having slopes. This mainly helps in controlling runoff having great velocity and increase in situ moisture in fields, water gets recharged and land erosion is prevented.
When building Contour trenches/ditches, the embankments or ridges can be used to plant grasses to protect the sides of the ditches from erosion. Vegetation can also be planted on these ridges which help in soil moisture conservation and this leads to increased fertility of soil.

In case of areas where the above mentioned techniques do not work and the ground is hard and rocky, then Stone lines or bunds are used. The methodology used to construct the stone bunds is similar to the contour ridges and it helps in controlling erosion due to fast flowing runoff.

Planting vegetation on the contour ridges in strips can be useful to check the speed of runoff water and help in conserving moisture content in the soil. All these area treatments are useful in increasing the in situ moisture of the land and prevent soil losses or erosion.

2.9.17. As per the corrected Guidelines (2001) released by the Ministry of Rural Development, GOI, regarding the Watershed Programme

Watershed Development in Gujarat

– A problem-oriented survey for the Indo-German Watershed Development Programme –

Executive Summary

• Background

Gujarat is one of the most industrialised states of India. The share of agriculture in the Net State Domestic Product is lower than in most other Indian states. Still, 66 percent of the population live in rural areas, most of them dependent on agriculture to make a living. Physical and agro-climatic conditions vary from the mountainous areas in the East to the plain lowlands mainly in central and northern Gujarat. More than 90 percent of the annual precipitation falls during the months of June to September. Erratic rains and frequent droughts are the main obstacles to intensive agricultural
production. Rainfall varies from an average 340 mm in the district of Kachchh up to 1800 mm in the southern hills. Limited availability of surface water and depleting groundwater resources constrain irrigation possibilities. Soil erosion is another factor, which severely limits agricultural productivity. Forest lands cover only about 10 percent of Gujarat. Food grains comprise 41 percent of cultivated crops. The major cash crops are cotton and groundnut. Agriculture is predominantly rainfed and even under irrigation the full water requirements of the crops are rarely met. Land holdings are generally small and fragmented and mechanisation is still less. Livestock husbandry, mainly on degraded areas, suffers from a lack of adequate fodder resources for the large number of animals. Few efforts are made by the villages to improve and regulate the use of common grazing lands. However, Gujarat has a very well developed cooperative milk industry, which is reflected in an increasing overall milk production. This study has investigated the problem situation in selected villages in Kachchh and Dahod district and looked into the institutional framework of watershed development in Gujarat. Field surveys for the target area analysis were carried out in six villages. In the five priority districts for watershed development activities, 15 NGOs and a number of Government institutions were met and assessed. The study is part of the planning process for the Indo-German Watershed Development Programme (IGWDP) in Gujarat. It is geared towards providing a qualitative description of important issues for a region specific watershed development approach and gives recommendations for possible adaptations of the watershed development approach. Executive Summary

Target area analysis

The target area analysis revealed a large variation concerning the environmental, agricultural and socio-economic situations. Important differences could be observed not only between the two districts where the study took place but also among the villages within individual districts.
Settlement patterns vary and have considerable influence on the communication structures within a village. A lack of possibility or willingness to communicate and cooperate does not necessarily mean hostility among groups. However, conflicts could be observed, both, among and within individual groups. The role of women depends on the social group they belong to. Most of them, except the Darbar women, participate in field work, while involvement in other economic activities differs from group to group. Women also constitute the most disadvantaged group concerning education. Literacy among elder people is usually lower than among youth, but in both age groups the gender bias prevails. In general, individual sub groups, defined by their cultural or socio-economic characteristics, face a different living situation in the villages and are confronted with different problems.

The common and paramount problems in all villages are water related. Access to existing drinking water sources is ensured for all groups but the efforts required depend on the type and location of sources. The water quality, particularly from open sources, creates health problems. Availability of water for irrigation purposes is very limited, hence, in most cases only one crop is grown per year. Erosion problems and the absence of appropriate cultivation practices further aggravate the problem of low agricultural productivity. Although some forms of wasteland management could be observed, overgrazing is a common problem in the wastelands of all villages.

Economic activities other than agriculture are limited in the villages. Even the selling of animals and of surplus production, i.e. milk and milk products, sometimes faces problems. Daily labour is the other important source of income. Very few villagers are engaged in specialised professions. Some women are successfully engaged in handicraft related activities. Migration can be observed in all villages. People leave temporarily or permanently to find employment in other rural or urban areas. Many people migrate between the cropping seasons due to a lack of Executive Summary.
employment opportunities within or near their villages. Remittances play an important role for the village economies.

**Institutional analysis**

In answer to the problem of natural resource degradation, more than 1200 watershed development projects have been implemented under different programmes by the Rural Development department in Gujarat since 1995. More than 70 percent of these are operated by NGOs. All government funded watershed development projects in Gujarat follow common guidelines, which determine implementation strategies, programme content and components, principles of project management, capacity building, financial aspects and monitoring and evaluation. Major aspects of the approach include sustainability, participation, empowerment and decentralisation. In general, the spirit of the common guidelines must be considered to be appropriate. However, as nation wide guidelines, they lack considerations of regional characteristics and problems. More flexibility would be required in many aspects to ensure appropriate handling of local problems. As an integrated, but, basically land based approach, watershed development needs careful consideration of equity concerns. Soil and water conservation measures alone might otherwise further benefit the rich instead of fostering social and economic cohesion.

Implementation problems also arise from cooperation difficulties among different GOs and NGOs. The treatment of forest lands and common property resources, as required in most cases when following the ridge to valley approach, faces many difficulties. For the last years the emerging Joint Forest Management Programme (JFM) has been trying to mitigate some of those problems. Meanwhile it is the largest programme of the Forestry Department. In addition to JFM, there are other government programmes, which are supplementary to and supportive of watershed development efforts. The status of NGOs in Gujarat is very strong. Many of them have been involved in watershed development related activities for a number of years.
already. They actively participate in policy dialogues with the Government and are a driving force in pursuing adaptation of the watershed development approach. Many of the NGOs have developed special implementation strategies, often depending on their specific field of interest or the background of their organisation and staff. Other NGOs are implementing regionally adapted solutions based, for example, on the problem of salinity in coastal areas.

In 1999, the National Bank for Agriculture and Rural Development (NABARD) joined the watershed development efforts by establishing its Watershed Development Fund. The fund aims at further strengthening participatory watershed development initiatives. The selection criteria for watersheds are a significant proportion of Scheduled Castes/Scheduled Tribes (SC/ST) population, high extent of rainfed farming and a high potential for watershed development. The regional watershed management cell of NABARD, which took up work in August 1999, is planning to undertake 19 projects at the first stage. Number and staff composition will have to widen, when the programme expands.

Successful project implementation demands a range of skills and attitudes at village, NGO and programme management level, which are not always or not sufficiently developed. Capacity building, therefore, plays a central role. Requirements at village level include raising awareness for environmental problems and resource management. Additional training will be required in order to make best sustainable use of conserved resources. Many NGOs in Gujarat have been successfully involved in watershed development projects. They have gained ample experience with this approach. What is still needed in some cases is to balance any existing bias in their work, which in many cases is either on the social or on the technical side. However, capacity building for the proposed IGWDP in these respects will probably not require the establishment of a separate institution. There are well established networks, which take care also of capacity building requirements. Requirements at the management level will mainly comprise
comprehensive supervisory and monitoring functions. Further conclusions
Based on the institutional analysis, different implementation arrangements
for the IGWDP in Gujarat appear to be feasible. NABARD may play the central
role, managing the programme alone. All major functions, like selecting
project implementing agencies (PIAs), coordination and monitoring tasks,
technical and managerial backstopping would be concentrated within
NABARD. Apart from the advantage of having a very clear line in decision-
making, such an arrangement would probably neglect the opportunities
associated with a more specialised labour division. Having an external
agency, which takes over the tasks in which NABARD does not have a
comparative advantage, would at least partly take Executive Summary
account of the deficiencies in the first proposal. Apart from the financial
management, probably a wide range of tasks could be handed over to an
experienced organisation, which would have well established contacts with
many potential PIAs. A third possibility could be to delegate tasks to regional
(district) networks of institutions (PIAs). Such an arrangement could take
advantage of the knowledge of institutions on the specific situation in the
regions where they already operate. As natural and socio-economic
conditions vary a lot among regions, taking maximum advantage of regional
experiences for planning, implementation and management seems advisable.
Successful programme implementation will also depend on the selection of
watersheds. Prime criterion for the selection of the region for intervention
should be the severity of natural resource degradation.

Abbreviations

AKRSP Aga Khan Rural Support Programme
ASA Action for Social Advancement
BAIF Bhartiya Agro-Industry Foundation
BPL Below Poverty Line
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPART</td>
<td>Council for Advancement of Peoples Action and Rural Technology</td>
</tr>
<tr>
<td>CATAD</td>
<td>Centre for Advanced Training in Agricultural and Rural Development</td>
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<tr>
<td>CEC</td>
<td>Commission of European Community</td>
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<tr>
<td>DDP</td>
<td>Desert Development Programme</td>
</tr>
<tr>
<td>DFID</td>
<td>British Department for International Development</td>
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<tr>
<td>DFO</td>
<td>Divisional Forest Officer</td>
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<tr>
<td>DPAP</td>
<td>Drought Prone Area Programme</td>
</tr>
<tr>
<td>DRDA</td>
<td>District Rural Development Authority</td>
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<tr>
<td>DSC</td>
<td>Development Support Centre</td>
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<tr>
<td>EAS</td>
<td>Employment Assurance Scheme</td>
</tr>
<tr>
<td>GAU</td>
<td>Gujarat Agriculture University</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GEB</td>
<td>Gujarat Electricity Board</td>
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<tr>
<td>GiDR</td>
<td>Gujarat Institute of Development Research</td>
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<tr>
<td>GO</td>
<td>Government Organisation</td>
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<tr>
<td>GSLDC</td>
<td>Gujarat State Land Development Corporation</td>
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<tr>
<td>GVT</td>
<td>Grameen Vikas Trusta Hectare</td>
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<tr>
<td>IGWDP</td>
<td>Indo-German Watershed Development Programme</td>
</tr>
<tr>
<td>IRDP</td>
<td>Integrated Rural Development Programme</td>
</tr>
<tr>
<td>IRMA</td>
<td>Institute of Rural Management</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>IWDP</td>
<td>Integrated Wasteland Development Programme</td>
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<tr>
<td>JBIC</td>
<td>Japanese Bank Integrated Corporation</td>
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<tr>
<td>JFM</td>
<td>Joint Forest Management</td>
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<tr>
<td>KfW</td>
<td>Kreditanstalt fuer Wiederaufbau (German Development Bank)</td>
</tr>
<tr>
<td>kg</td>
<td>Kilogramme</td>
</tr>
<tr>
<td>mm</td>
<td>Millimetre</td>
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<tr>
<td>MoA</td>
<td>Ministry of Agriculture</td>
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<tr>
<td>MoEF</td>
<td>Ministry of Environment and Forests</td>
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<tr>
<td>MoRD</td>
<td>Ministry of Rural Development</td>
</tr>
<tr>
<td>NABARD</td>
<td>National Bank for Agriculture and Rural Development</td>
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<tr>
<td>NGO</td>
<td>Non-Governmental Organisation</td>
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<tr>
<td>NPK</td>
<td>Nitrogen-Phosphate-Potassium</td>
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<tr>
<td>NRM</td>
<td>Natural Resource Management</td>
</tr>
<tr>
<td>NSDP</td>
<td>Net State Domestic Product</td>
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<tr>
<td>NWDPRA</td>
<td>National Watershed Development Programme for Rainfed Areas</td>
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<td>PIA</td>
<td>Project Implementing Agency</td>
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<td>PIM</td>
<td>Participatory Irrigation Management</td>
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<tr>
<td>PRA</td>
<td>Participatory Rural Appraisal</td>
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<tr>
<td>RRA</td>
<td>Rapid Rural Appraisal</td>
</tr>
<tr>
<td>Rs</td>
<td>Indian Rupees</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
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<td>--------------</td>
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<tr>
<td>SC</td>
<td>Scheduled Castes</td>
</tr>
<tr>
<td>SGSY</td>
<td>Swarnjayanti Gram Swarojgar Yojana</td>
</tr>
<tr>
<td>SHG</td>
<td>Self Help Group</td>
</tr>
<tr>
<td>SIRD</td>
<td>State Institute of Rural Development</td>
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<tr>
<td>sq. km.</td>
<td>Square kilometre</td>
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<tr>
<td>SSI</td>
<td>Small Scale Industry</td>
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<tr>
<td>ST</td>
<td>Scheduled Tribes</td>
</tr>
<tr>
<td>USD</td>
<td>US Dollar</td>
</tr>
<tr>
<td>VRTI</td>
<td>Vivekanand Research and Training Institute</td>
</tr>
<tr>
<td>WD</td>
<td>Watershed development</td>
</tr>
<tr>
<td>WDF</td>
<td>Watershed Development Fund</td>
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<tr>
<td>WDP</td>
<td>Watershed Development Programme</td>
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<tr>
<td>WDSCA</td>
<td>Watershed Development Programme in Shifting Cultivation Areas</td>
</tr>
<tr>
<td>WDT</td>
<td>Watershed Development Team</td>
</tr>
<tr>
<td>WREMI</td>
<td>Water Resource Engineering and Management Institute</td>
</tr>
</tbody>
</table>

1 crore = 10 Million
1 lakh = 0.1 Million
1 foot = 0.305 metres
1 metre = 3.281 feet
Introduction

The following study was commissioned as part of the planning process to extend the coverage of the Indo-German Watershed Development Programme (IGWDP) to the state of Gujarat. In 1995 the National Bank for Agriculture and Rural Development (NABARD) prepared a plan for a watershed development programme in Gujarat, based on the successful IGWD pattern. The Government of Gujarat requested NABARD to take up the programme and NABARD, which is involved in the IGWDP since 1992, approached the German Kreditanstalt fuer Wiederaufbau (KfW) for financial assistance. Following the good experience with the grant based watershed development programme for soil and water conservation in the state of Maharashtra the proposal was forwarded for closer scrutiny and a preliminary approval was given to grant funding. Due to political reasons the sanctioning process of the project came to a standstill for three years and was picked up again only in 1999. It was decided that funding could be provided to NABARD following the patterns of similar financial cooperation projects in other states. In order to adapt the implementation procedures to the regional specifications of Gujarat, a pre-feasibility study, focusing on a problem-oriented description of the institutional environment and the intended target area was carried out. The task was commissioned to the Centre for Advanced Training in Agricultural and Rural Development (CATAD). This publication is the result of the research undertaken by CATAD. A full-fledged feasibility and planning study will be carried out before final approval of the programme. The main readers of this study will probably be the people concerned with watershed development in Gujarat. The content of this report, however, renders itself to wider scope and usage. The description of the situation in certain villages, the problem analysis and the types of interventions described can be of use before beginning to plan different programme and project activities, either in the field of natural resource management or in other related areas. In particular, certain points
mentioned in the report will also be helpful in assessing different approaches adopted by different institutions for watershed development.

**The study consists of six main parts:**

A brief description of the state of Gujarat: Important background information for the readers not familiar with the area. The chapter focuses on relevant information in the field of natural resource management.

- A description of the concept and methodologies applied in conducting the research: The chapter provides the research framework and the background of the study.

- A description and assessment of the main actors, government institutions and NGOs, and their respective activities in watershed development.

- A description of the target group and a problem analysis based on surveys in six villages in two different districts in Gujarat: The chapter describes the situation in the villages and analyses the main problems, which intended project interventions would address.

- An assessment of capacity building requirements at different levels and a description of capacity building institutions in Gujarat.

- The last chapter explains the crucial points for planning interventions particularly in the field of natural resource management. The chapter highlights the main issues, which have to be taken into consideration in planning and implementing the expected watershed development programme.
Physical characteristics of the State of Gujarat

The state of Gujarat is situated on the western side of India covering an area of 196,024 sq. km. It accounts for about six percent of the total geographical area of India and five percent of the population. Almost one third of the coastline of the Indian sub-continent belongs to Gujarat. 34 percent of the 41.13 million people live in urban and semiurban areas uniformly spread throughout Gujarat. The population density ranges from 397 per sq. km in Central Gujarat to only 27 persons per sq. km in Kachchh (DIRECTOR OF CENSUS OPERATIONS, 1992, p. 12).

Agriculture

The contribution of the agricultural sector in the state gross domestic product (GDP), which was 48 percent in 1971, declined to 21 percent in 1997/98. However, 57 percent of labourers are engaged in agricultural activities (NABARD, 2000a, p.2). The average land holding size in Gujarat has been declining continuously over the years, from 3.15 ha in 1986 to 2.93 ha in 1991 (NABARD, 2000a, p. 2). The average size of holdings varies from 5.06 ha in the arid north-west (Kachchh) to 1.76 ha in the Southern Hills (Dangs and Valsad). About 50 percent of the farm families are small farmers, holding land up to two hectares. Approximately 33 percent of the farmers, hold land between two and five hectares. The number of holdings has increased from 2.43 million to 3.52 million between 1971 and 1991. The land holdings are fragmented, which implies that farm 2 Programme Area mechanisation is difficult. The level of subsistence farming is high (FERGUSON, n.d. a, p. 3).

Out of the total cropped area, 41 percent are under food grains. These are: pearl millet (Pennisetum glaucum), sorghum (Sorghum bicolor), paddy (Oryzasativa), maize (Zea mays) wheat (Triticum ssp.) and different types of pulses. 18 percent of the total cropped area is under oilseeds like groundnut (Arachis hypogaea), and castor (Ricinus communis), 14 percent is
cultivated for cotton (Gossypium herbaceum), 2 percent for sugarcane (Saccharum officinarum), 1 percent for tobacco (Nicotiana tabacum) and the area cultivated for other crops is 24 percent. These figures signify the importance of nonfood grain crops in the agricultural produce of Gujarat (NABARD, 1998, p. 4; FERGUSON, n.d. a, p. 2). Groundnut and cotton are the main cash crops (ARPU, 1998, p. 44). The fertiliser consumption was about 70 kg/ha in 1997. Since 1995, the consumption has increased at an annual rate of 5.6 percent (ARPU, 1998, p. 40). The Nitrogen-Phosphate-Potassium (NPK) ratio, however, is imbalanced, since comparatively too much nitrogen is applied (NABARD, 2000a, p. 3). The reason for this imbalance is that urea is easily available here and is comparatively cheaper (JOSHI, 2000, p. 68). Nearly 70 percent of the agricultural area in Gujarat is under rainfed cultivation (NABARD, 1998, p. 4). It is worth noting that even if crops are irrigated, the full irrigation requirement of the cultivated crops is generally not met. It is estimated that not more than 60 to 70 percent of the on-farm irrigation requirements are effectively provided in most cases. Thus water is an important limiting factor to achievement of potential yields (FERGUSON, n.d. b). The degradation and, consequently, poor fertility of the cultivated land is another important reason for low production and low productivity of the cultivated crops (NABARD, 1998, p.4).

The role of NGOs in watershed development

A couple of thousand NGOs that are registered in Gujarat have long experiences in development work. Specifically in Gujarat, many NGOs have been founded by charitable industrialists, who are originally from the region. Some of the NGOs had originally sprung from an NGO mother organisation and subsequently got autonomous. Other NGOs, however, were initially SHGs. Their activities range from tasks in urban slum areas, advocacy for and empowerment of the poor as well as women, tribal development programmes, health and sanitary programmes, employment generation programmes, natural resource management, agro-forestry and animal husbandry development schemes to research and training activities.
Photographs of Watershed development
CHAPTER – 4

REVIEW OF LITERATURE

4.1 Introduction

4.2 Books & journals

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4.2.3 Natural Wealth, Progress And Management

4.3 Ph.D. Research Thesis

4.3.1 A Study Of The Economic And Social Impact Of Activities Conducted On Groundwater Sources

4.3.2 Dr. Pradipsinh Gohil Has Conducted A Study Titled “Study Of The Effects Of Managing The Watershed Program At Saurashtra”

4.3.3 Studies Regarding Use Of Watershed Development Programs In Agricultural Land And Sowing Area Ratio

4.3.4 Studies On The Watershed Development Program And Its Effects On Productivity, Crop Density And Pattern.

4.3.5 Studies Showing The Watershed Development Program And Its Affect On Water And Irrigation Sources, And Also The Farmers Participation Level

4.3.6 Studies Showing The Watershed Development Program And Its Affect On Employment, Income And Economic Level

4.4 The State’s Monthly Reports

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4.4.5 Central Government Watershed Management:

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4.5.1 Dated 07/03/2010 Published Article By The Central Government Department Of Ministry Of Water Resources In Phulchhab:

4.5.2 Dated 08/03/2010 In Gujarat Samachar Titled “Be Alert Towards Management Of Water Sources”

4.5.3 Dated 10/04/2010 In Phulchhab

4.5.4 29/04/2010 Divya Bhaskar Titled “Water Is Life”

4.5.5 30/04/2010 Divya Bhaskar Titled “Water Is Life” / “No Water No Life”

4.5.6 Dated 29/07/2010 In Sandesh, Shamji Antala

4.5.7 Dated 09/09/2010 In Phulchaab, V.L. Babariya

4.5.8 Dated 23/01/2011 Economic Times

4.5.9 Gujarat Samachar 31/10/2014

4.6 Review Of Central Government’s Reports


4.6.2. Program Monthly Journal Volume July 2010