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Water Conservation Methods: A study area Pakur District Jharkhand

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ABSTRACT - *Water is one of the most precious natural resources and a key element in the socio-economic development of any region like country or state or any district we use water for drinking , irrigation, industrie, transport and for the production of hydroelectricity. Water is a cyclic resource which can be used again and again after cleaning or treatment.*

The best way to to conserve water is its judicious use. For irrigational use, there is an urgent need for proper water management in irrigation sector. Over irrigation, waterlogging, seepage, overdraft, lowering of water table, wasteful use of water can be checked by lining them. Scientific and advanced technique of irrigation can save the water. Water pollution and means of it will have to be checked.

Increase the use of dry farming, use the recycled water for cooling purpose in industries, by using the recycled water over and over again, by collecting the water used in kitchen sink , wash basin and in bathroom in a tank and reuse in flushing toilet and gardening, freshwater can be saved. Today the situation has come that 20th century used to resolve around water. Similarly , the 21st century is in focus on the issues of clean drinking water. An important step in finding solutions to the issues related to water and environment conservation would be to bring about a change in the attitudes and habits of the people Today the situation has come that 20 century used to revolve around water. Similarly, the 21stcentury Although water harvesting, nowadays a kind of re-awakening is going on all over the country or all over the world. Water harvesting efforts are being done in dams, reservoirs, and others. Water conservation has become an essential part of daily. routine today Rainwater harvesting is most effective methods of water management and water conservation. In this way collection and storage of rainwater used for human , animals, and plant need. Water conservation measure comprises not only creation of reservoir for storing water but also prevention of loses.

KEYWORDS: *Development, Resources, **Treatment, judicious, waterlogging, overdraft, wasteful, seepage, pollution, rain water harvesting, conservation.***

I. INTRODUCTION-

Water comprises 97 percent of the world's readily accessible freshwater and provides the rural, urban, industrial and irrigation water supply needs of 2 billion people around the world. As the more easily assessed surface water resources are already being used, pressure on groundwater is growing. In the last few decades, this pressure has been evident through rapidly increasing pumping of groundwater, accelerated by the availability of cheap drilling and pumping technologies and, in some countries, energy subsidies that distort decisions about exploiting groundwater. This accelerated growth in groundwater exploitation—unplanned, unmanaged, and largely invisible—has been dubbed by prominent hydrogeologists ―the silent revolution. The problems of over-abstraction in Pakur in both rural and urban settings are well known, with aquifers being depleted here in the hard rock terrain of plaeuteu region Jharkhand, , and in the sedimentary aquifers of the Ganges valley.

The unplanned and non-scientific development of ground water resources, mostly driven by individual initiatives has led to an increasing stress on the available resources. The adverse impacts can be observed in the form of long-term decline of ground water levels, de-saturation of aquifer zones, increased energy consumption for lifting water from progressively deeper levels and quality deterioration due to saline water intrusion in coastal areas in different parts of the district.

Rainwater harvesting is accumulating and storing of rainwater. Rainwater harvesting may be used to provide drinking water for human beings, domestic animals and for irrigational purposes and may also be used to refill an aquifer through groundwater recharge. Rainwater collected from the roofs of houses, local institutions and tents or from specially prepared areas of groundwater, can make an important contribution to drinking water. Now-a-

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days, importance of rainwater harvesting is getting momentum to our water resources. The increasing water needs for growing population can only be met if excess rainwater in the form of runoff is properly harnessed. There are a number of types of systems to harvest rainwater ranging from very simple to complex industrial systems. Generally, rainwater harvesting is done either from the ground or from a roof. The rate at which water can be collected from either system on the plan area of the system, its efficiency and intensity of rainfall. It is high time that people involved in water resource development and management should think systemizing the catchments and emphasizing the storage of rainwater in the district. The methods of groundwater recharge are different in urban and rural areas. Roof top rainwater, storm runoff harvesting through recharge pits, recharge trench, tube-wells and recharge wells are some methods for urban areas, while in rural areas rainwater harvesting through gully plug, gabion structure, percolation tanks, check dams and dug well recharge etc. are important methods. The different methods of rainwater harvesting suitable for the study area are given below (Fig.6.16):

II. LITERATURE OF REVIEW

Aristotle(384-322BC) recognized the cycle of path of water between land and air, evaporation and condensation and their importance in rainfall, and that the some rain is discharged by streams, while some percolates into the Earth and reappears importance in rainfall, and that some rain is discharged by streams, while some percolates into the Earth and reappears importance in rainfall, and that the some rain is discharged by streams, while some percolates into the Earth and reappears in springs (**Meteorologica**).

Dayal (1972), in the same survey has reviewed the progress of studies in river valley development planning in the country while **Chatterjee** and **Lahiri (**1972) have tried to review the contributions to the knowledge of natural hazards like floods and droughts in India, water pollution and problems arising out of injudicious use of irrigation water. **Dhawan** (1988) has made extensive use of country-wide statistics and other secondary data to assess the productivity and stability of irrigated agriculture in India. Similar works have been done by different scholars like **Garg** (1979), **Chopra, Rao** and **Sengupta** (2003), **Gupta** and **Deshpandey** (2004), **Rajvaidya** and **Markandey** (2005), **Gurjar** and **Jat** (2005), **Kumar**, **Singh** and **Sharma** (2007), **Garg** (2008) and **Ray** (2010).

Todd and Larry (2005) have tried to present the fundamentals of Groundwater hydrology. They have tried to make an understanding of the fundamental principles, methods and problems in the Groundwater field specifically occurrence and movement of Groundwater, well hydraulics and impact of global climate change on Groundwater level; etc. **Raghunath** (2007, 1987 and 1982) has attempted to elucidate on all the aspects of Groundwater such as, its assessment, development, utilization and management, in a very lucid manner giving comprehensive knowledge of Groundwater evaluation. **Tripathi** (2007) has analyzed the importance of water and its scarcity, storage and conservation of water through structures like wells, tanks, lakes and dams. The present book makes an elaborate discussion on precipitation, evaporation, run-off, underground water, uses of water and legal as well as scientific aspects of water in detail.

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Conservation, management planning and policies regarding water resources were also discussed by many of the authors like **Ackerman(1965), Yadav(1981), Rai(1993), Rai(2000), Rambilas(2000), Paul(2002), Bansal(2004), Hussain(2006), Llamas M. Ramon and Custodio, E. (2002**) has given an individual and unbiased perspective on the subject of intensive Groundwater development**.**

OBJECTIVES/ NEED:

- to overcome the inadequacy of surface water to sove our demands
- to solve the decline in water levels.
- to improve the water quality by dilution .
- to increase the agricultural production .
- to improve ecology of the area by increasing in vegetation cover etc.
- to enhance availability of water at specific place and time and utilize rainwater for sustainable development.

III. METHODOLOGY

This present paper is based on government offices reports, some primaryobservations, researches conducted by the research scholars, review of related literatures, websites, Published reports and articles by different states, central government, local bodies and NGO's secondary data collected. All data sources have been applied to have a conception of the water conservation and crisis management problem in the study area

STUDY AREA (PAKUR DISTRICT)

The district Pakur,is located between 21^0 58'N to 25^0 18' N and 83^0 22' E to 87^0 58'E in the north eastern part of the state of Jharkhand, is surrounded by Sahibganj, Dumka, Godda, and state of West Bengal. with geographical area of 1805.59 Sq. km. the district posses as 9.00422 lakh population.

The area and population of district are 2.27% & 2.83% of the state respectively. Almost all major rivers became dry in the district most of year shows the scarcity of water. Water level is continuously decreasing due to over exploitation of water in crop producing area in the district. Because of falling water table, people are making deeper hand pump or boring gradually. While recharging rate of underground water is much lesser than withdrawal of water. Due to cultivation surface soil continue to be used and degraded, Besides the soil degradation and erosion also help to decrease agricultural production.

Most part of the distirct is undulating topography like hilly area, enclosed by basaltic flows of Rajmahal trap. And other geological formation of the district laterite, alluvium and gondwana rocks. Eastern part of the district covers alluvium deposit while western part covers Gondwana formation and rest part occurs laterites, and some other geomorphological structure like rolling pan plain having ancient ridges and resistant lava plateau of Rajmahal found in southern part Pakur is largely covered by forest and small hills; a part of parasnath hills spreads in chhotanagpur plateau and Santhal Pargana. And topographically Pakur is divided into the hilly area, the rolling area and the alluvial area of these three parts. The hilly area is made from North corner of the district up to the Southwest border with the state of West Bengal. In the North and North Eastern part of the district, having a narrow strip of alluvial soil, between the Ganga feeder canal and the loop line of Eastern Railway, is very fertile area.

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Geological Formation & Hydrogeology Of The Area

This is 24th district of state of Jharkhand; most part of the district is identified by undulating topography like hilly area, enclosed by basaltic flows of Rajmahal trap. And other geological formation of the district literate, alluvium and gondwana rocks . Eastern part of the district covers alluvium deposit while western part covers Gondwana formation and rest part occurs literates, and some other geomorphological structure like rolling pan plain having ancient ridges and resistant lava plateau of Rajmahal found in southern part. These southern plateau uplift a general height and almost cover all the district. Pakur is largely covered by forest and small hills, a part of parasnath hills spreads in chhotanagpur plateau and Santhal Pargana. So, geographically Pakur has a basaltic trap and sedimentary beds, Quartz and hard rock of granitic gneisses are also found in some parts of the district. And topographically Pakur is divided into the hilly area, the rolling area and the alluvial area of these three parts. The hilly area is made from North corner of the district up to the Southwest border with the state of West Bengal. In the North and North Eastern part of the district, having a narrow strip of alluvial soil, between the Ganga feeder canal and the loop line of Eastern Railway, is very fertile area. And in the last rest part is covered by rolling plain, is less beneficial for agricultural activities. The main rivers flowing are Bansloi, Brahmani, Torai and Gumani in the district.

Water in the area is recharged mainly by the atmospheric precipitation. The water is generally not improved by seepage of river water because rivers are discharge in nature. Whereas the fluctuation and depth of water table depends. on geomorpholgical features, Litology and Rainfall. There is 75% part of the district covered by crystalline igneous and metamorphic rocks of Precambrian age. It is seen that in majority, most of the aquifers are formed by hard rocks. literates and reverine sands form good aquifers near river bank, while the Archian and Precambrian covers entire areas, which has very low porosity due to its nature and here permeability is very low. In later through fracture, fissures, joints and weathering of the rocks porosity and permeability is developed. By the hydro-geological view water in any area is controlled by a topographical setting, thickness of weathered zone, size extent, openness and interconnection of joints and fractures. In Pakur 19% of total water and surface water is being utilized for irrigation (TABLE), Industry and other domestic uses. Therefore the combine water management is crucial for sustainable economic development.

Pakur district receives an annual rainfall of 1399 mm, and maximum rainfall occures during the rainy season. It varies from 2.5mm.-337.8mm., where August month receives maximum and December month receives least rainfall every year from south-west monsoon but here regional distribution is variable on account of the deposition of hill ranges. So the district encounters extreme seasonal variation in monthly rainfall. Humid and sub humid climate is found in the district although a hot dry summer, a good rainy season, and cool winter season is experienced here. The temperature goes high up to 40.70^{0C} during summer and lowest up to 2^{0c} in winter. Here in the district the rainfall, the relief, hill slopes, forests and waste lands cause a significant percentage of surface flow. In this region the geology does not permit heavy infiltration of rainfall because of hard rock terrain. so natural recharging of water is very less about 10-11% of the surface flow. In this district there are three major river basins and other small streams draining out the district's water. The rivers are mostly rain fed.

NEED FOR WATER CONSERVATION

water is the elixir of life. It is the most important natural resource for life. In the coming times.It is a serious problem in many areas of the world.Will go in lack of position. Although Water is most abundant on earth, But its distribution veryuneven Changes in latitude, rainfall patterns, topography, etc. affect its availability,Water is a resource that can be produced or stored whenever, through any technologicalprocess. production or collection is not possible. on our earth Non-salinite water and seawater, the quantity is permanently fixed. non saline water which is essential for lifeIts quantityis 2.7% of the total amount of water found on Earth. In this, almost all of the 2 percent, foundas snow caps, snow rivers, and clouds is found.the rest of it Found in the form of lakes, underground sources and rivers. It is surprising thatthe salt water found in the seas Which is the main source of saline water on this earth. About 85% of the rain falls directly into the sea, and never reaches the ground,. The remaining partof this rain falls into the ground and fills wells and lakes, and increases the flow of rivers,

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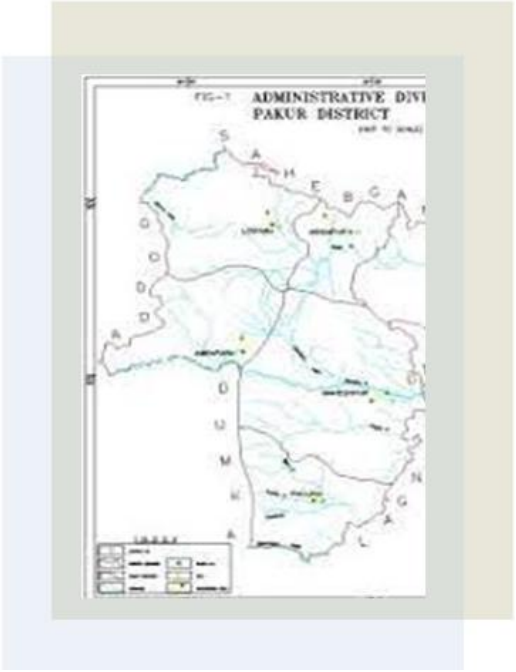

Status of pakur

Pakur's condition is extremely bad, Although Pakur, Although Pakur is not one of the wettest parts of India, it has a slightly humid part, most of it is mountainous, some part is plain. Here the distribution of water is uneven on the basisof time and place, the average rainfall of the district is 1150 mm annually. But its distributionis very uneven.On an average, the number of snowy days in the district is very less. The rest of the year remains dry. Not only this, in some areas of the north district, there is less rainfall up to500. So in some areas the rainfall is very less. Due to this uneven distribution of rainfall,there is severe water scarcity in many parts of the district. Due to the increasing demand of domestic, industrial and agricultural related works, the available quantity of water isdecreasing.This situation may become more serious in future. Not only this, irrigation has beenexpanded in the district in the last few years. Due to which our water resources havebeen over-exploited. Our increasing urbanization and industrialization has further increased the demand for water. Due to which there has been acute shortage of water inmany parts of the district.Therefore, it becomes necessary that we conserve water and save it from being misused.For our increasing population we need more food material, to increase food production,more water is needed for irrigation. Hence there is an urgent need for water conservation.

The 21st century is grappling with the problem of

Today the situation has come that 20 century used to revolve around water. Similarly, the 21stcentury is in focus on the issues of clean drinking water. An important step in finding solutions to the issues related to water and environment conservation would be to bring about a change in the attitudes and habits of the people.

With the increasing water needs, the dependence on

Today the situation has come that 20 century used to revolve around water. Similarly, the21st century is in focus on the issues of clean drinking water. An important step in findingsolutions to the issues related to water and environment conservation would be to bring about a change in the attitudes and habits of the people.In view of the present rate of increasing population of Pakur and in an effort to meet theincreasing demand of available water resources, Pakur district will be successful in creatinga negative image as the population of the most thirsty people in the next 20 years. Such a situation cannot be prevented. If the available resources are not used carefully and wisely. Rapid urbanization, industrializationand ever-increasing population have polluted most of the surface water bodies. and madethem unfit for human use.With the increasing needs, their dependence on ground water has increased. It is estimatedthat by 2050, half the population of Pakur will be urban and will face the problem ofsevere water scarcity.

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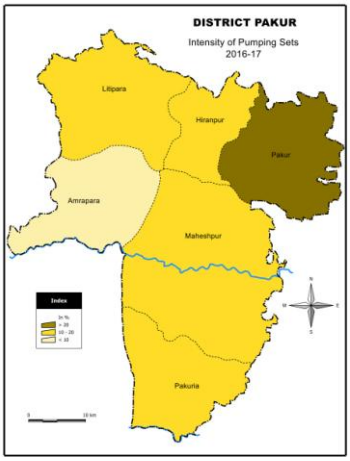
Due to lack of water –
1 dry
2 Increasing demand for irrigation
3 Industrial demand
4 pollution
5 Reduced use of water resources
6 Waste of water and irresponsible attitude



The duration of the dry season is also very long in this district. During this time our waterdemands are met by the water stored in lakes, underground water and reservoirs. Withthe ever-increasing demand for water, these sources of water are proving to be inadequate.Therefore, there is a need to emphasize those efforts. Which is due to more and more waterscarcity during the dry season – 1 Drought 2 Increasing demand for irrigation 3 Industrialdemand 4 Pollution 5 Decreased use of water resources 6 Waste of water and irresponsible attitudeThe duration of the dry season is also very long in this district. During this time our waterdemands are met by the water stored in lakes, underground water and reservoirs. Withthe ever-increasing demand for water, these sources of water are proving to be inadequate.Therefore, there is a need to emphasize those efforts. Which is more and more during the dry season to store rain waterThis can be done by storing water in reservoirs, lakes or tanks. Or can be done by rechargeof ground water. These are simple ways to increase water supply.

Water Harvesting Methods

Although water harvesting, nowadays a kind of re-awakening is going on all over the countryor all over the world. Water harvesting equipment was present in Palestine and c. Greek 4000years ago. In ancient Rome, tanks were built in every house to store water.And arrangements were made to connect the city's water drains with the courtyards of the houses.3000 years before Isha, farmers of neighboring districts used to collect water and use it for irrigation.

Water Harvesting Methods in Ancient Time 1 Drains 2 Ponds 3 Ponds 4 Wells 5 Underground Tanks

Water harvesting efforts are being done in dams, reservoirs, and others. Water conservation has become an essential part of daily routine today. Ground water recharge through water harvesting is now gaining importance in every society. The water from the forest goes slowly, because the trees of the forest make the plants go away. And the underground water goes to wells lakes and rivers.

Cooked and earthen pipes and canals were used to control the flow of water.

Methods of water harvesting in ancient Pakur

Water has been stored in Pakur since ancient times. Prior to this, the Indus Valley Civilization flourished on the banks of the Indus river in India about 5000 years ago andthere was a very good system of water supply in the western and northern parts of India.The way the drains were covered under the streets of the cities of

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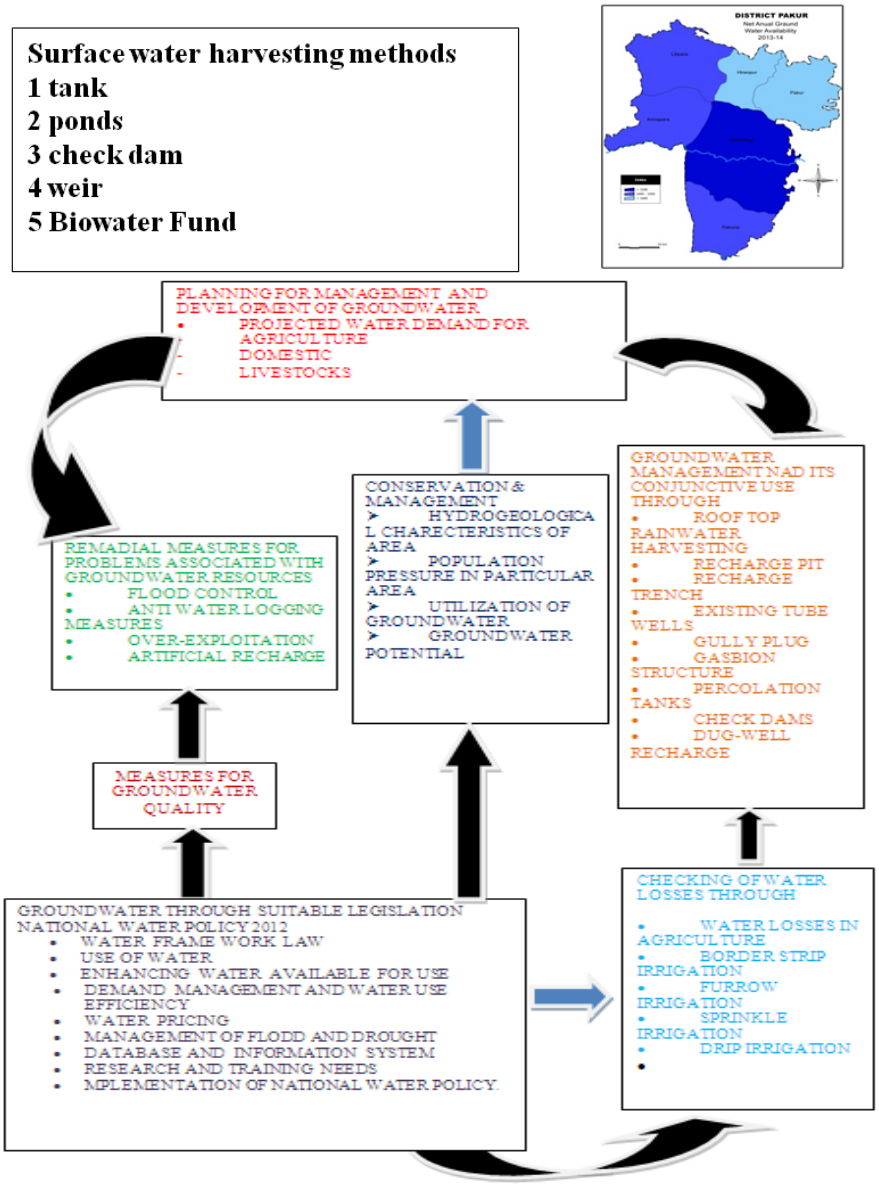
Mohenjodaro and Harappa, it is clear how adept the people of this culture were in cleanliness and hygiene. The best example of this is Dholaviras (a hilltop town in the Rann region of Kutch in Gujarat).One of the oldest water harvesting systems is at the Nanae Ghat near the Western Ghats. Thestones of these hills bore many reservoirs which provided drinking water to the traders whiletraveling on the ancient trade routes.There was a system of water harvesting and storage in every fort of every region. The reservoirs,which were made by breaking stones in the form of ponds and wells, have water supplyreservoirs in districts like Raigad.Not only this, in the western part of Pakur, many houses were made like this, in which eachhouse had a water storage system. In these houses, where there was a water harvesting system, rain water from thereIt was stored in mud pits.This arrangement is still found in some old houses and houses of this area. But now it is indilapidated condition and is on the verge of destruction. Brick drains and mud pipes havealso been made in these areas, through which water is sent from one place to another.

Modern Methods of Water Harvesting

In modern methods, two methods of rainwater harvesting are being shown.

1. Collection of rain water on the ground floor for the purpose of future use
2. Replenishing ground water.



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METHODS OF GROUND WATER HARVESTING

Storage of rain water on the surface is a traditional technique, for this water tanks liketanks, ponds, check dams were used. Replenishment of rain water is a new concept and for this the following structures are used.

1. Pits - Refill pits or pits are designed to recharge shallow aquifers.

2. Aquifers - These are porous layers of soil made of ridges or stony rocks from which abundant water can be extracted for use. Their construction goes from one to two meters in width and one to 1.5 meters in depth. Which are also filled with rate, soil and pebbles.

3. Preneches These are constructed when permeable rocks are available at shallow depth. Ditch 0. 5 to 1 meter wide and 1 to 1. It can be up to 5 meters deep and 10 to 20 meters long. Its width, length and depth depend on the availability of water. Filter material is used to bridge these.

4. Open wells - Existing wells can be used as refill structures. It is necessary that before pouring water into the well, it has to pass through the filtration devices. 5- If the availability of water is limited, the existing hand pumps should be replaced with shallow / deep aquifers.

5**. hand operated pump**

If water availability is limited, existing hand pumps can be used to recharge shallow/deep aquifers. It is necessary to pass the water through filtration devices. This will not block the wells used for recharge,

6. refill well - Refill wells of 100 to 300 mm in diameter are often constructed for re-filling of deeper aquifers. In these water is passed through filter devices with a view to prevent blockage.

7 Refill shaft - diameter of the refill shafts of shallow water bodies 0. 5 to 3 meters and these shafts are filled with stones and pearls.

8. Lateral shaft of bore wells - related to the availability of water for the purpose of refilling shallow and deep water aquifers. Lateral shafts 5 m to 2 m wide and 10 to 30 m long are constructed with one or two bore wells. Behind the lateral shaft lay stone and coarse sand.

RAINWATER HARVESTING

It is one of the most effective methods of water management and water conservation. This term used to indicate the collection and storage of rainwater used for human, animals and plant need.

- by collecting rainwater from the roof of the house or from any convenient surface. can be stored. Just keep in mind that the water stored at least from the foundation of the house. Be at least three feet away. The amount of water to be stored depends on the area to be collected.

To calculate the amount of water stored, multiply the roof area of your house by the rate of rainfall per square metre. Average rainfall in India 1. 17 meters, while the average rainfall in Pakur is 1. is 18 meters After that that value is 0. Multiply by 909 (this accounts for evaporation and other losses) and then multiply this finding by 1000, as 1 square meter of water storage would provide approximately 105,300 liters per year (1. 17 x 100 x 0. 90 x 1000 = 105300 .

Rainwater harvesting is accumulating and storing of rainwater. Rainwater harvesting may be used to provide drinking water for human beings, domestic animals and for irrigational purposes and may also be used to refill an aquifer through water recharge. Rainwater collected from the roofs of houses, local institutions and tents or from specially prepared areas of water, can make an important contribution to drinking water.

Now-a- days, importance of rainwater harvesting is getting momentum to our water resources. The increasing water needs for growing population can only be met if excess rainwater in the form of runoff is properly harnessed. Generally, rainwater harvesting is done either from the ground or from a roof.. The methods of water recharge are different in urban and rural areas. Roof top rainwater, storm runoff harvesting through recharge pits, recharge trench, tube-wells and recharge wells are some methods for urban areas, while in rural areas rainwater harvesting through gully plug, gabion structure, percolation tanks, check dams and dug well recharge etc. are important methods.

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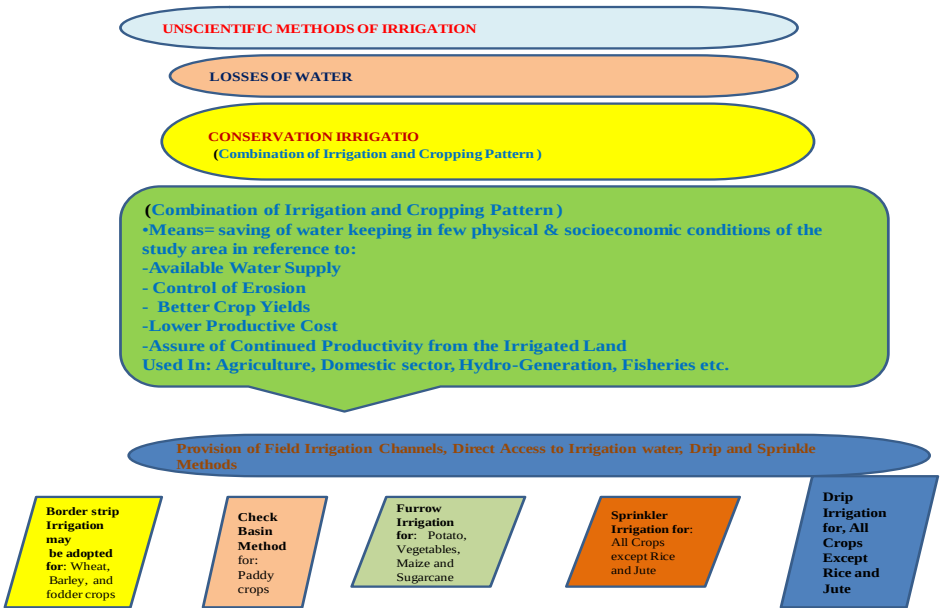

IV. CONCLUSION-

Rainwater harvesting is a device of accumulating and storing of rainwater. Rainwater harvesting may be used to provide drinking water for human beings and for irrigational purposes and also be used to refill an aquifers (water recharge). Roof top rainwater, storm runoff harvesting through recharge pits, recharge trench, tube-well and recharge wells are some methods suitable for urban areas, while in rural areas rainwater harvesting through gully plug, gabion structure, percolation tanks, check dams and dug well recharge etc. are important methods and suitable for the study area.

Water conservation measure comprises not only creation of reservoir for storing water but also prevention of losses.. The other half is lost due to application losses on the field, following addition of faulty irrigation practices and seepage from canal system. The application losses result from over-irrigation, and also when field irrigation channels, grading and shaping of fields, consolidation and rectangulation of holdings, suitable methods of irrigation, irrigational scheduling, rational supply of water, appropriate cropping pattern etc. are either inadequate or non-existent.

Water losses from over-irrigation can be checked by volumetric charging of water or educating the farmers about its adverse consequence and providing them assured and rational supply of water whereas canal seepage can be checked by lining the canals. Most of the water losses could be minimized by adopting the concept of 'conservation irrigation', that is, a combination of irrigation and cropping pattern, best suited to the area, keeping in view the physical and socio-economic conditions of the area. The main practice of water conservation is a method of irrigation. It means using cropping irrigation and agricultural practices that maintain the land in permanent agriculture with optimum yields and also for final solution of alkali problems, water logging and numerous other evils. Careless handling and negligent waste of irrigation water is responsible for many grave consequences which now confront irrigated agriculture.

Loss of irrigation water also occurs due to unscientific method of irrigation, that is, by inundation from one field to other. In fact, there should be provision of field irrigation channels so that each field would have direct access to irrigation water and drip and sprinkle methods of irrigation should be increasingly adopted. At present irrigation methods should be adopted by border-strip (in case of wheat, barley and fo+dder crops), check basin (in paddy) and furrow irrigation (in potato and vegetables) in the study area.

To sum up, it can be said that the entire study area i.e.Pakur is Indo-Gangetic alluvial lower Plain which is distrusted by many small steams/nala of Ganga and Banshloi river deposited by them. Therefore, coarse sediments of newer and older alluvium have better water bearing properties and have capacity to yield moderate to abundant supply of water to wells.

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