Final Report of Innovation Project: 2015-2016

SHC-315

"Inventory and Prospect of water Conservation in Western Rajasthan"

University of Delhi

Innovation Project- 2015-16

Final Report

1. **Project Code: SHC – 315**
2. **Project Title: Inventory and Prospects of Water Conservation in western Rajasthan.**
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Certificate of Originality

This is to certify that the research work carried out and the final report submitted by the project Investigators and students of Innovation Project having **Project Code- SHC-315** and title **Inventory and Prospect of Water Conservation Western Rajasthan** of **Shivaji College** have carried out original research work summited as final report to the University of Delhi. The work and the report are original. Any plagiarism dispute arising out of the project will be our responsibility.

31/10/16

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1. Project Title: **Inventory and Prospect of water conservation in Western Rajasthan.**

2. Project Code: **SHC 315**

3. **ABSTRACT**

As the world is changing, we are left with tougher challenges regarding the utilization of natural resources. Today, man is blessed with modern techniques which are free to use or abuse it according to their convenience. Where water ends, life ends. In contemporary world, water has become the priority and primary part of our lives and the worst thing is that it is depleting rapidly. Where one part of the world has surplus water, one part does not even avail minimum desired amount of water. The Western Rajasthan is bestowed with the technology which supply substantial amount of water in water deficient arid region. Gone are the days, when the farmer used to perform extensive farming in order to fulfil their basic needs. Noticeable are the changes in cropping patterns. The extensive farming has shifted rapidly towards intensive farming. The mechanization in farming has managed to improve the livelihood of the farmers of Western Rajasthan but the pressure on land and water resources become acute. The dependency on water resources has been broadened by submersible tube wells which has successfully replaced traditional wells to extract groundwater. It was found that some parts of Western Rajasthan overexploited groundwater whereas some are totally dependent on rainwater for their daily needs as well as agriculture. Some are also blessed with the facilities of government and are provided with water from Indira Gandhi Canal. The current scenario looks good but the near future of the region is in a grave danger. The overexploitation of groundwater by the farmers is contributing to a non-sustainable farming practice. Not only this, the casual and lavish use of water will also result to nothing but crisis for our future generation. This will not only affect the social life of the people but also the economic life. The study of inventory of groundwater depletion in Western Rajasthan deals with non-visionary human approach to fulfil their wants instead of focusing on their needs. The objective is to study several areas, look for the water related issues and come up with some inventories and prospects for sustainable water usage. The mining activities and

intensification of agriculture depleted the source and catchment of seasonal rivers. The future generation will be left with no or very little amount of water because of this non-sustainable water management. The research includes interactive study of Western Rajasthan on the supply, availability of water, usage, quantity, quality, crisis and conservation. Thus, we have to come along with some sustainable water management techniques.

Key words: *Groundwater, Submersible, tube wells, Conventional, water conservation, Cropping patterns, Sustainable, Nadi(pond), Hod(open surface cemented Tank), Tanka(Tank), TDS(Total dissolved salts), IGC (Indira Gandhi Canal).*

4. INTRODUCTION

The population in the modern world is increasing at a very fast pace, it has created the new benchmark of 7.125 billion. But the resources available for the present population are limited and to meet the large demand with meager supply of resources, technological innovation are supporting them. As a result of technological advancement, there is a severe pressure on the available finite resources. One of the most precious resource that is under threat is water. Water not only determines sustainability but also the existence of life form. Water is scarce in the semi-arid and arid climatic region of Western Rajasthan and therefore we ought to conserve even the little amount of water which is available in the region.

Western Rajasthan receives water in three ways:

1. Water from Rain
2. Water Supplied through Canals
3. Extraction of Groundwater

Rainwater: In the arid and semi-arid region of Western Rajasthan, there is scarce rainfall. With very few rainy days, the amount of rainfall received by the region is approximately 25-50cm. conventionally, the people of Rajasthan depended on the rainwater to fulfill almost all the purposes. Rainwater Harvesting was a common sight in the past but with the introduction of modern technologies, rainwater harvesting technique is depleting and the pressure on groundwater is increasing.

Canal: Indira Gandhi Canal (IGC) runs through the western Rajasthan and acts like the lifeline of the people of Western Rajasthan. IGC has successfully managed to transfer water to Western Rajasthan from western Himalayas, but it has its own limitation. For instance, the amount of water received by Western Rajasthan from IGC is not sufficient to meet the demand of Western Rajasthan population. The network of IGC is limited to very few regions of Western Rajasthan and most of the parts of Western Rajasthan is devoid of this water supplied by IGC. The water supplied by IGC is mostly taken to for agricultural and drinking purpose.

Groundwater: With the advancement of technology and the know-how to extract water from the ground to meet the demand is enjoyed by most of the people of Western Rajasthan. The level of groundwater and its quality vary from one place to another in Western Rajasthan itself. Technology has given a way to extract groundwater, as a result of which the groundwater of Western Rajasthan is rapidly depleting. Apart from that, as the depth of groundwater increase, the Total Dissolved Salt (TDS) of the water increases too, making it impossible to profitably use groundwater.

Few characteristics of Western Rajasthan are that it receive low/scanty and erratic rainfall with high summer temperature along with low humidity. High-velocity of wind used to blow during summer. It receives 20 to 35 cm average rain annually while potential evapotranspiration is 2,00 cm. Therefore its evaporation exceeds precipitation with negative water balance and acute water deficit conditions particularly before monsoon. The area is having alkaline soil with high pH value more than 8.

The innovation project of 'Inventory and Prospects of Water Conservation in Western Rajasthan' focuses on inventory of water conservation techniques/approaches that can be taken into consideration because of its practical implication in Western Rajasthan to conserve water and then ultimately improving the depleting ground water. The conservation of the available water stands at the forefront of the study.

5. Research problems/hypothesis/Objectives

- To enquire the status of various sources of drinking water in respect to quality and quantity.

- To investigate the various convectional water conservation techniques in respect to region specific geographical conditions
- To purpose the water sustainable conservation technique in accordance to modern technological innovation and traditional knowhow of the native masses.

6. Methodology:

The study has been conducted on the basis of extensive field work, collection of first-hand information and primary data from the villagers, village Sarpanch through questionnaire method. The participatory approach was also applied to obtain precise information about inventory and prospects of water. The respondents were randomly selected on the basis of their economic and social compositions. Informal and formal interview methods have been used. Finally, the findings have been evolved on the basis of analysis of collected information. The villages for the survey were selected on the basis of their distinct source of water as pond, close to IG Canal, supply of tap water and a tribal dominated village.

Sample Collection: Soil and Water samples were collected from all the existing sources of groundwater use for drinking water from varying depth of 100 feet to 1200 feet in the study area for the investigation and chemical examination.

7. Result and Discussion

7.1. **Soil Analysis**: The soil samples were collected from 12 villages with varied geographical conditions to obtain the pH value, nitrogen, carbon, Potassium, Phosphorous and water retention capacity. This exercise was performed to find out the different chemical components present in the soil and the relation with the natural conditions.

Table. 1 Permissible limit of Various soil components.

SL NO.	FACTORS	RANGE
1	pH	6.5-7.5
2	NITROGEN	0.90%-1.92%
3	PHOSPHOROUS	0.07%-0.60%
4	POTASSIUM	1.10%-2.50%
5	ORGANIC CARBON	Minimum 1.72%

Sources: BIS

Figure.1. Organic Carbon Percentage in soil. Figure.2. Phosphorous Percentage of soil.

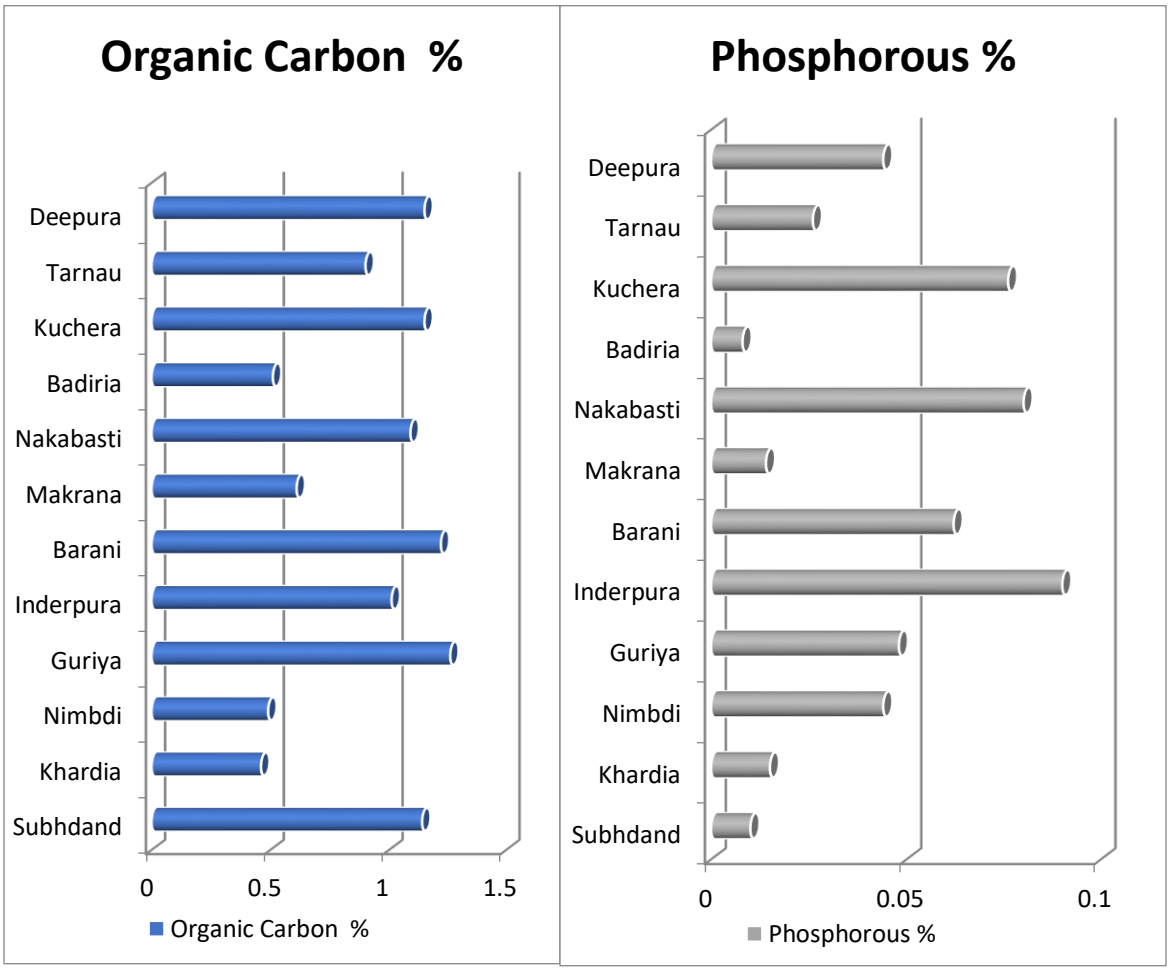


Figure.3. Water holding capacity Percentage of soil.

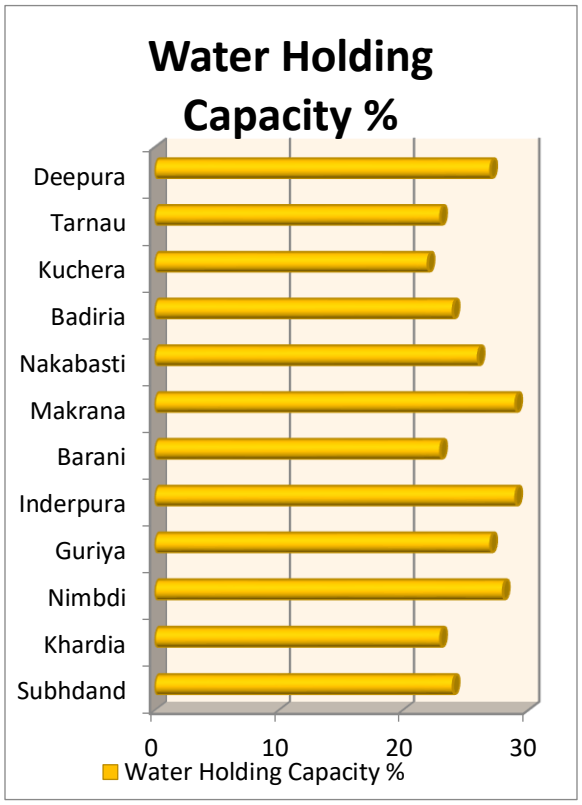
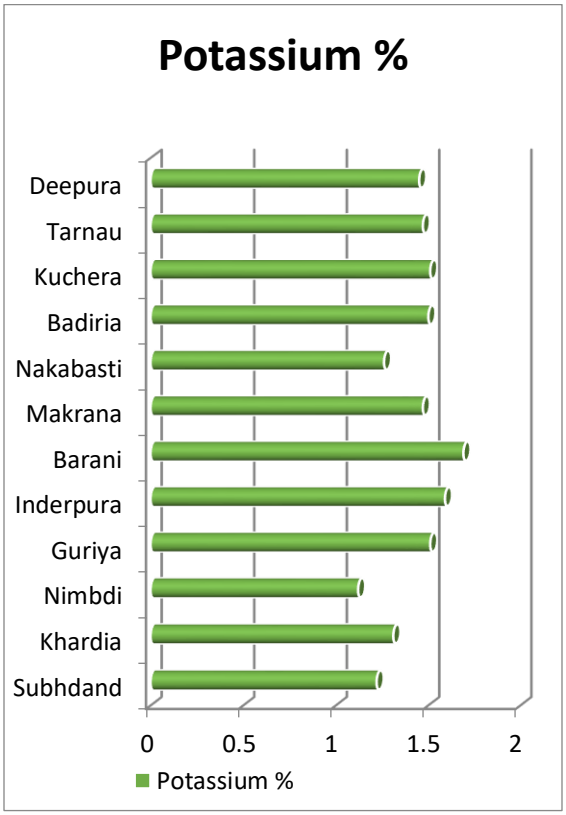


Figure.4. Potassium Percentage of soil.



From the reports, following conclusion were derived:

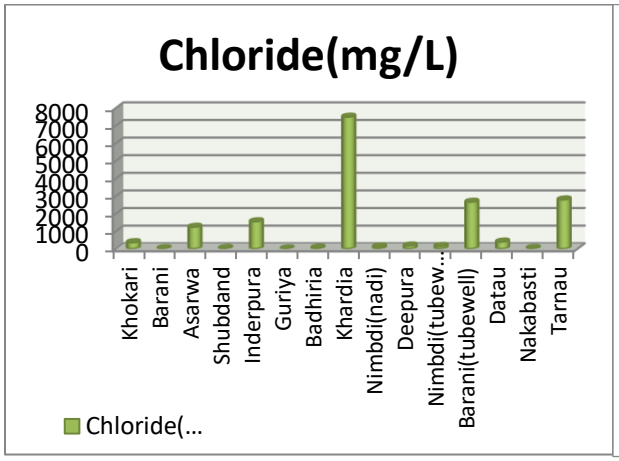
Micronutrients present in the soil are varying, essential to the plants for their growth and reproduction. If we talk about Nitrogen, the soil should contain 1.92%-.90 % nitrogen as all parts of the plants require nitrogen. Also, because it is the major constituent of proteins, nucleic acids, vitamins and hormones, but what we see in these villages of Rajasthan is that, all the village soils have lower nitrogen content than required for proper plant growth, Which shows a clear reason why here all types of plants do not grow. Even if some grows, they do not give a proper yield. This also gives a reason why groundnuts, cowpeas, moong etc. are grown here, due to their low nitrogen requirement but high yield. Here, Deepura has the minimum nitrogen content with 0.11% while, Makrana has maximum nitrogen content with 0.17%.Coming to Phosphorous, yet another essential element is required by plants for carrying on several phosphorylation reactions.

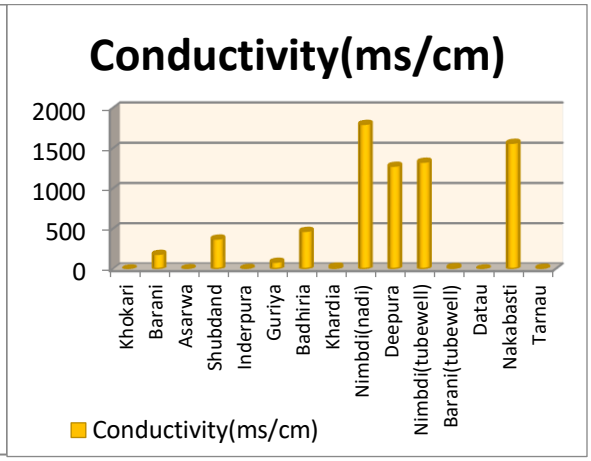
The range of phosphorous in soil should be 0.07%-0.60%.If we look onto the surveyed villages, we see that all the villages have ranged and proper phosphorous content with Makrana having least of it with 0.014% and Inderpura with highest phosphorous content with 0.09%.

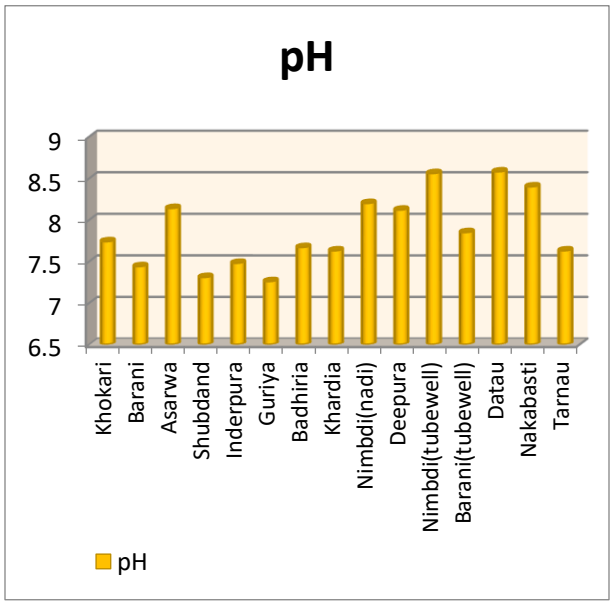
When we talk about potassium, it is again one of the most required elements by plants. It is required in more abundant quantities in the meristematic tissues, buds, leaves etc., for opening and closing of stomata, anion-cation balance, and activation of enzymes and maintenance of the turgidity of cells. It should be in a range of 1.10%-2.50%.Here all the villages lie in this range and have enough potassium which is required with minimum presence of it in Nimbdi with 1.12% and maximum presence in Brani with 1.69% Talking about pH, almost all the villages have high pH, showing the basic nature of the soil. While, pH range should lie between 6.5-7.5,we see that maximum villages exceed the limit having high pH, among which lowest is of Guriya and Brani with pH 8.08 and highest in Khardiya and Kuchera.

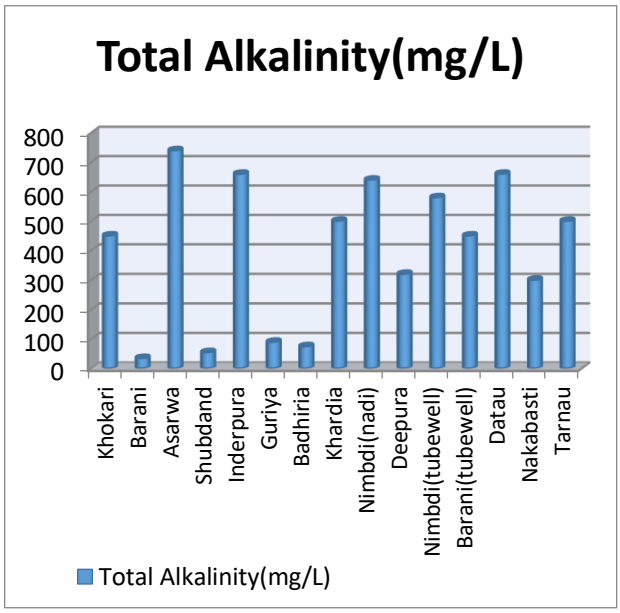
If we observe the water holding capacity of the soil, it simply means the water holding capacity of the soil. The ability of soil to retain water is strongly related to particle size .Water molecules hold more tightly to the fine particles like clay. But in case of sand, it provides easy passage of water through the profile. Thus it is quite easier to understand why the water holding capacity of these regions is low. Among these, Kuchera has minimum water holding capacity due to presence of more sandy/coarse soil particles with 22%, whereas Makrana has the maximum water holding capacity with 29%, because of presence of fine soil particles too. Finally, coming to Organic carbon, it is one of the most important constituents of the soil due to its capacity to affect plant growth has both a source of energy and nutrient availability through mineralization. Presence of organic carbon should not be less than 1.72% but as we see here, all the villages have very low content of organic carbon, thus affecting the soil quality and making it little suitable for agriculture. Due to this, only limited crops like bajra, guar etc. can be grown whose requirement can be fulfilled with lower organic carbon. Maximum organic carbon has been found in soils of Guriya with 1.16%, where lowest presence is found in Khardia with 0.46 %.

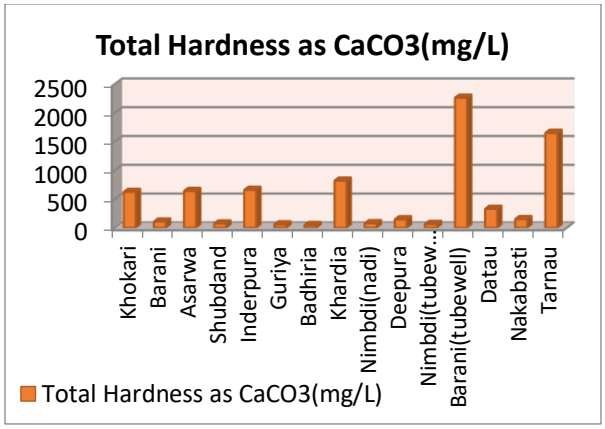
Water quality analysis

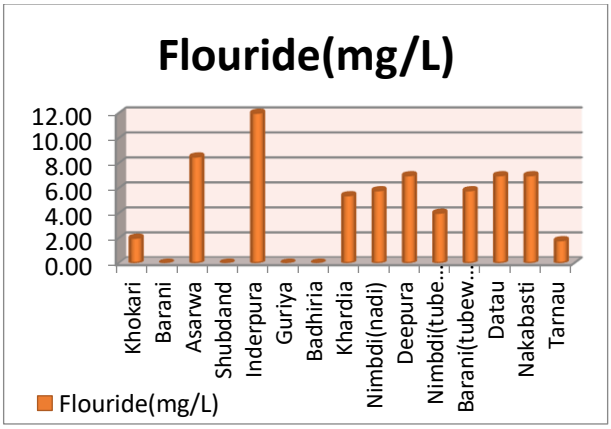


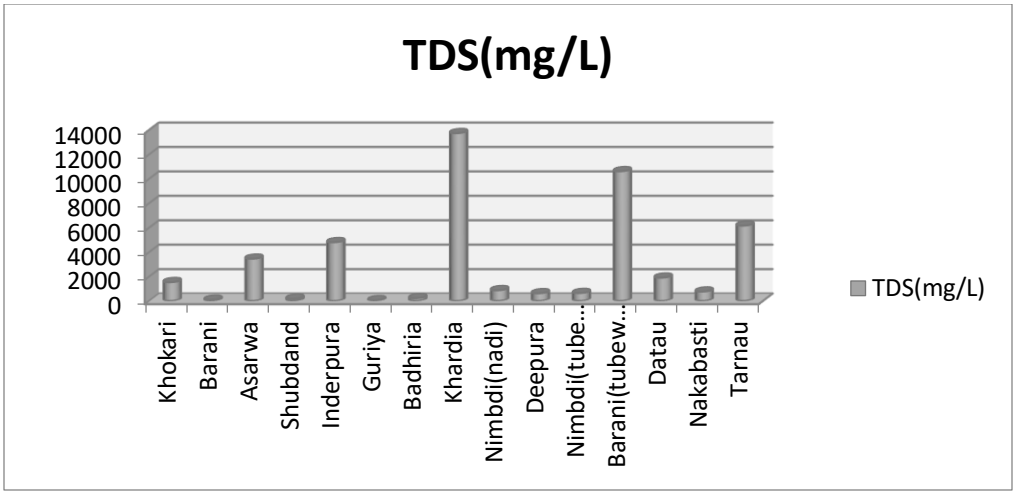












We can infer several results from the reports and graphs of water we collected from this region. Firstly, pH which should be in a range of 7.5-8.5 here is very much in range. Maximum villages have ranged pH with some exceeding the limit, proving the water to be more basic, which Guriya having the least pH of 7.26 and Datau having the maximum pH of 8.58.Coming to the next parameter we have TOTAL DISSOLVED SALTS which has a permissible limit of 350 mg/L,but what we observed is that the TDS of maximum villages is very high,with Khardia having the highest with 13740mg/L and Guriya having least TDS of 60mg/L.Another of our parameter says that that the total hardness of water of this region is really high due to presence of high content of minerals. Hardness has been maximum reported in water collected from tube well of Barani with 2260 mg/Land least hardness found in Badhiria with a hardness of 48 mg/L.Calcium content has been found to be high in water of tubewell from Barani with 488 mg/L and lowest in Nimbdi with 8 mg/ L.Magnesium on the other hand is also found to be high ,with highest as 249.6 mg/L in Barani tube well and least in Guriya with 3.36 mg/L.Chloride and Flouride in this region has been observed to be very high and out of range and limits.Chloride has been reported to be maximum in Khardia with 7490 mg/L and minimum in Guriya with 8.86 mg/L,whereas fluoride on the other hand has been found to exceed limita in most of the villages with maximum reported as 5.8 mg/L in Barani tube well water and has been found to be absent in Barani nadi,Shubdand nadi,Guriya and Badhiria. Alkalinity, our next parameter show the alkaline nature of the water,showing it to be more basic or acidic. It has been found to be in limits, with few being more alkaline.Asarwa showed the most alkaline water with 740 mg/L whereas Barani nadi water showed the least alkalinity of 35 mg/L. Lastly we have the conductivity which in a way shows

the amount of anion-cation presence or the presence of salts. As conductivity increases, sality increases with fair increase in hardness and hence in TDS. Observation proves that conductivity in maximum villages is quite high, with maximum reported as 1800 ms /cm in Nimbdi nadi and minimum in Khokari with 3.1 ms/cm.

Table-2: BIS standards of permissible and excessive limits of various parameters.

S.N.	Parameters	P	E
1.	pH	6.5	8.5
2.	TDS	500	2000
3.	ALKALINITY	200	600
4.	TH	300	600
5.	FLUORIDE	0.5	1.5
6.	CHLORIDE	250	1000
7.	NITRATE	45	100
8.	CALCIUM	75	200
9.	MAGNESIUM	30	150

Here: - P-Permissible limit, E-Excessive limit [BIS-Bureau of Indian standard.]

From the graph,we can conclude that mostly the villages have water that are basic in nature with more alkalinity.Nextly,as we surveyed and as the the reports,we can say that maximum villages have high TDS and hardness in water,due to the high presence of salts like calcium,magnesium etc.The graphs suggest that,the water collected from tubewell of the villages have high TDS as well as hardness whereas water collected from taps and nadis or tankas which are filled with rainwater have a minimum and ranged amount of TDS nd hardness as well.What we see here is that the hardness of water and the TDS is increasing with increase in depth of groundwater.So,it would not be wrong to say that TDS and hardness are directly related and proportion to the depth of groundwater.This is causing many ill effects to human and livestock as well such as joint pains,tooth decay ,stones in kidney and gall bladder,foot and mouth disease in livestock etc.Another problem which is highly prevalent in this region is high presence of fluoride and chloride,which not only causes fatal diseases to humans like poor etc and livestock ,but also increases the conductivity of water,naturally leading to higjer hardness and TDS.

So,finally what is concluded is that water is a major problem not only quantity wise here,but qualitywise equally.We can see that in maximum villages,water quality is worse,specially where tubewell water is used.What can be done is to harvest and conserve more and more rainwater either at houses itself or in commom water bodies and use it for drinking and bathing

purposes.This is because,the Alkalinity,hardness,TDS,fluoride and chloride content all are in best ranges only in rainwater,whereas tubewell water is more a poison than a life which is very naturally leading to many diseses and early deaths as well..Moreover,high floride and chloride contents is highly harmful for body metabolism and for enzymes to function.So,for a disease free and healthy society,this water must be treated before being consumed.

C. Ephemeral and seasonal rivers lost the identity.

The recurring droughts, limestone/ marble mining and agricultural intensification in catchment area of the seasonal rivers forced to disappear the river even in the rainy season. The Jojri, Kagya and Kantli river in Jodhpur and Jaisalmer never find fluvial water in the last 2 decades. The disappearance of these rivers decreased the carrying capacity of the region, accelerated the out migration of male working youth population and shift on ground water for agricultural requirements.

Photo.1. Seasonal river Jojri which lost the identity.

D. Disappearance of conventional rainwater harvesting techniques.

After the introduction of mechanization in agriculture, farmers managed to obtain the water for drinking/ household and agricultural purpose from ground water through tubewells. The tubewells also get subsidized electricity and ensure the drinking water round the year which led to disappearance of conventional rain water harvesting techniques in rural areas. Every household constructed a tanka/ underground tank of 5000 to 25000 liter water capacity which is filled by the tractor borne tanker on regular intervals on very minimal prices.

Photo.2. un-maintained nadi in Nimbdi village, Nagaur.

E. Depleting common water bodies

- Though places like Subhdand, Beetan and Khardia have common water bodies, but due to the following reasons, these are not in use.
- These water bodies contain organic impurities which make it unfit for drinking.
- Animals enter the water bodies and make it unsuitable for drinking bathing and other purposes.
- Due to the dirty surrounding area and mixing of nadi water with all the dust and dirt , the appeal of the water to be used for drinking is greatly reduced..
- Presence of animal excreta in the unfenced surrounding area also reduces the appeal of the nadi water to the modern people
- The nadi needs to be cleaned from time to time and due to the easy accessibility of water on the door steps, people deny to take the responsibility of maintaining the nadi.

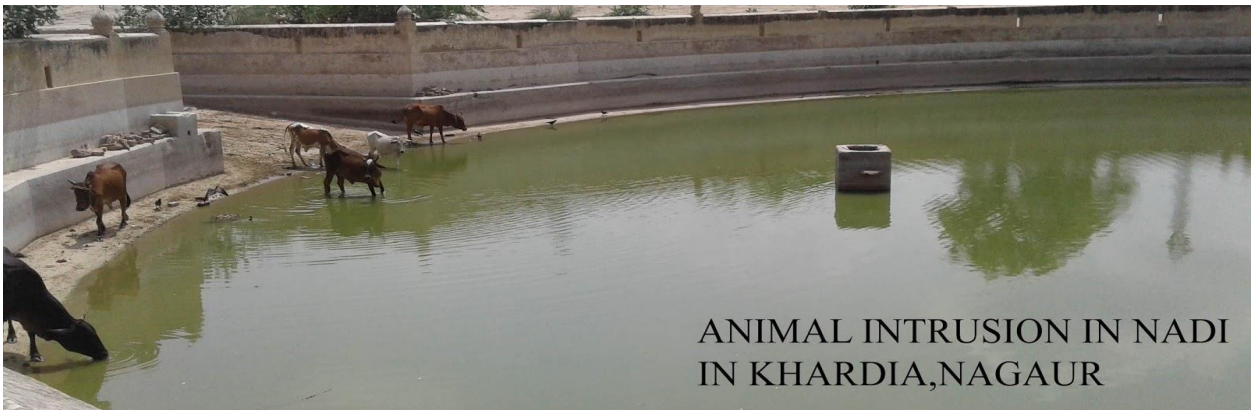


Photo.3. Animal Intrusion in Nadi, Khardia, Nagaur.

F. Complete dependency on Ground water

Groundwater: Groundwater comes into usage when the water from the rain and canal fails to fulfil the large demand for water. Even though the groundwater is not available in all the area, its accessibility and property vary from place to place. The quality of ground water also deteriorated with increasing depth of tube wells. The increased depth of tube wells supply the water with very high TDS value which increased sodacity and alkalinity of the soil which leads to diminishing return in farming. The study focusses on the inventory of water conservation techniques/approaches being practiced and presenting new techniques which can be implemented in Western Rajasthan and implications of technology on depleting ground water. The region is arid to semiarid with low and erratic rainfall, high summer temperatures, low humidity and high-velocity wind causing an average potential evapotranspiration of 2,000 mm, a negative water balance and acute water deficit and very high pH value (alkalinity) of soil.

G. Over use / misuse of submersible pumps

The economy of western Rajasthan rests on availability of groundwater with most of the population engaged in agricultural activities which require substantial amounts of water for irrigational purposes. This ignited the revolution centering on the biggest boon and bane in terms of ground water retrieval i.e. introduction of tubewells in the region. Commercialization of agriculture intensified in 1990s with focus on cultivation of cotton which is a highly water intensive crop. Tube wells proved to be the carrier behind the surge in productivity witnessed

during the few years that cotton dominated agriculture domain. Now, intensification of agriculture because of easy access of water to crops for irrigation and to larger areas of cultivated land became the new phenomenon.

Water is pumped out through submersible pumps with pipes of diameter 8" to 12" varying from aquifer to aquifer. Usage of outer pipes with diameter of 1" and 2" allowed for the out flow of water with pressure so that carpet irrigation with drip and sprinklers could be practiced by innovative farmers. The introduction of submersible installation is cheap and fast as tube well up to the depth of 500-700 feet installed within 2 days' time in all types of rock structure.

In a bid to help farmers, subsidies on tube well installation were introduced by government earlier and at later stage the introduction of submersible to each farmland continuously encroached on vicinal acquire. Also, availability of electricity for most of the day allowed over extraction of ground water with the recharge falling much below the extraction. Overexploitation of water can be perceived through a steep decline in water table from 50ft in 1980 to 300 feet in 2000.

Table.3. Ground Water depletion with the intensification of cash crops.

S. No.	Village	Year-1990	Year-2015	Reason
1	Chowkri Kala (Jodhpur)	70 feet	350+ feet	Cotton cultivation and submersible pumps
2	Bitan (Nagaur)	200 feet	550+ feet	Agricultural intensification of chilies, cotton and onion and increased number of submersible pumps.
3	Nedayi (Jaisalmer)	250 feet	450+ feet	Agricultural intensification of horticulture and vegetables. Rapid increase in the number of tube well installation.
4	Thaiyat (Tribal Village-Jaisalmer)	350 feet	400+ feet	Losing the agriculture land to Indian Army. Bhil tribal village with extensive farming of wheat, vegetables and Bajra.

5.	. Kharda (Bikaner)	400 feet	1200 feet	Poor artisan aquifer level and cultivation of water intensive ground nut.
6.	Nathusar on the margin of IG Canal (Bikaner)	300 feet	250 feet	Ground water level increased marginally due to the close proximity of IG Canal
7.	Deep pura (Nagaur)	300 feet	750 feet	Agricultural intensification of horticulture(Onion) and vegetables. Rapid increase in the number of tube well installation.
8.	Guriya (Nagaur)	250 feet	600 feet	Cotton cultivation and submersible pumps.

During the same period the cropping pattern also shifted from food grain crops (wheat) to cash crops (cotton) which require more water for irrigation. The famine crippled Rajasthan between 1997 and 2003, which left the farmers with no alternatives other than mercilessly extracting the groundwater particularly for cotton cultivation. During the same time state electricity board provided single phase electricity to every household and single phase submersible pump technology were also introduced so that all the farmers could extract water round the clock even on a cheaper cost. The three phase electricity was made available only for 6 to 8 hours a day while single phase electricity was made available round the clock so that water could be pumped out not just for 6 hours but during any time of the day. Simultaneously, population was increasing and demand of agricultural products was also increasing therefore commercialization of agriculture was inevitable. But as famine continued for longer period, groundwater depleted to such great depths that even after further digging, no signs of presence of water were seen. This forced farmers to shift from water intensive crops to minimal water consuming crops.

Then, the farmers started constructing temporary cum permanent artificial concrete tank or earthen ponds with a sheet of polythene of area measuring 100 sq. yard to 2000 sq. yard depending on the requirement and economic constraints of the farmers. These artificial water

storage tanks are known as “Hod”. The state government also gives subsidy for the construction of such “Hods” used for harvesting the rain water. But farmers fill these “Hods” by extracting the ground water through submersible pumps which run round the clock for the purpose apart from harvesting rainwater. The submersible pumps as such cannot meet the demand of irrigation because of slow velocity of water but once the “Hod” is filled, that water is released with high velocity and discharged to irrigate the fields quickly as per the demand. Though these “Hods” are very useful and instrumental in increasing the intensification of cropping but simultaneously, they are also responsible for depleting the ground water table.

The situation has worsened to such magnitude that many villages like Chowkri Kalan have been classified as "Dead" for tube wells because groundwater level has reached to a very critical level. Here, installation of any new tube well is strictly prohibited by local administration but the power of money glistens above the law. Also, to limit the extraction of groundwater, three phase electricity is supplied only for 5-6 hours a day to the tube wells for irrigation. But to overcome this hitch, farmers started using single phase electricity for extracting the ground water with the help of submersible pumps for refilling the “Hods” which are meant for rain water harvesting. Thus, submersible pumps have aided in victory of greed over sustainability in the phase of nature and environment crisis.

H. Change in Cropping Pattern

Cropping pattern refers to the proportion of area under different crops in a definite period of time. With the cultivation of water intensive profitable crops, the depletion of groundwater table has increased at a fast rate. Apart from that, the immense amount of fertilizers and pesticides used to maintain the crops is also depleting the soil quality by increasing the soil sodicity and decreasing the microbes present in the soil. There should be towards the convectional food crops like bajra and pulses again as the water demand of these food crops is low. By doing so, we can reduce further depletion of groundwater table and also the rate of crop failure will reduce as these are drought-resistant crops.

With the introduction of submersible tube well in Western Rajasthan, the focus has shifted to water intensive crops that yield a high profit to the farmers. The cropping pattern of a region mainly depends on upon:

1. Geo-climatic condition
2. Water availability
3. Availability of market
4. Profit criteria

Water for agricultural purposes has become easily available after the submersible tube wells were introduced in Western Rajasthan. The direct effect of the submersible tube well can be seen in the change of cropping pattern of Western Rajasthan. Crops with higher Minimum Support Price (MSP) like wheat (food-grain), mustard (oil-seed), onion (vegetable) and cotton (cash crop) are now grown in Western Rajasthan region.

Photo.4. Cotton Cultivation in Nagaur.

Photo. 5. Stray and drought cattles on roads

Other commercial crops which are cultivated in the region includes Grams, Chilies, Husks and Til. Before the technology advancement, the crops grown were bajra, millets, and pulses. These are drought resistant conventional food grain crops. The cultivation of water intensive profitable crops has resulted in the depletion of groundwater table. Apart from that, the immense amount of fertilizers and pesticides used to maintain the crops is also depleting the soil quality by increasing the soil sodicity and decreasing the microbes present in the soil. There should be towards the conventional food crops like bajra and pulses again as the water demand of these

food crops is low. By doing so, we can reduce further depletion of groundwater table and also the rate of crop failure will reduce as these are drought-resistant crops.

Table. 4. Change in cropping pattern after introduction of submersible tubewell

Kharif Crops (1990's)	Kharif Crop (2015-2016)
Bajra	Cotton
Jowar	Linseed
Pulses	Husk (Isabgol)
Moth	Gwar
Millet	Spinach

Table. 5. Change in cropping pattern after introduction of submersible tubewell

Rabi Crops (1990's)	Rabi Crop (2015-2016)
Gram	Mustard
Wheat	Onion
Chilly	Carrot
Barley	Tomato
Arhar	Cummin Seed

I. **Intensification of farming:** Being a drier region, Western Rajasthan has always done extensive farming but this kind of farming wasn't able to deliver a proper livelihood to its

practices. In order to improve the livelihood, the farmers have recently shifted to intensive farming after moving away from extensive farming. The change in the farming practices has also resulted in the types of the crop grown in the region. The focus has shifted from dryland crops to water intensive crops.

J. **Accessibility of technology:** The modern development in technology has managed to touch every area of the country and Western Rajasthan is not an exception. The availability of technology has not only ensured the usage of technology but also the overuse of the technology. The technology gained by the people of Western Rajasthan has taught them that they can extract groundwater anytime they want. Without any clear picture of the future, the exploitation of groundwater with the help of technology is leading to a non-sustainable development in the farming sector.

In a region suffering from drought, farming is difficult. But Western Rajasthan, on the other hand, is not only doing farming but is depending on water intensive crops to improve their livelihood. This intensive farming demands water supply from multiple sources. And during the unavailability of multiple sources of water, groundwater goes through an acute pressure to meet the demand of water intensive crops. The demand of water has given rise to the demand of submersible tube wells.

Conditions favouring use of submersible tube wells:

a. Cheaply availability of ST technology

b. Banking finance availability

c. Subsidized electric supply for ST on farmland by government

d. Cheap drilling/ installation by machines

e. Regular failure of monsoon (drought) for five years

Result of using submersible tube wells:

a. Water is drilled out mechanically and easily. The depletion of water has taken place up to 500 feet.

b. Intensification of cropland

c. Deviation from rainwater harvesting techniques such as nadi and talab

There are many conditions favouring the use of submersible tube wells that allows withdrawing groundwater. This has resulted in an enormous amount of pressure on groundwater. Groundwater is overexploited with submersible tube wells by the people. The result of this is clearly visible in the form of depletion of groundwater in the region in the past two decades.

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The main objective of the government initiative of hods was to store the surplus rainwater in the farmlands which can be used later for practising farming even during the drier seasons. A problem is visible in the actual implementation of the hods. The hods were constructed above the surface, that too with plastic polythene and metalled things. The hods were further filled up with groundwater, which clearly indicates a failure in the understanding of the actual reason behind the implementation of hods.

Hod, however, has managed to supply a substantial amount of water to the farmers throughout the year. This has resulted into agricultural intensification. After its introduction, the farmers have shifted from drip irrigation and sprinklers irrigation to carpet irrigation. In carpet irrigation, a huge amount of water is misused.

No doubt about the result that Hod has managed to increase the output of the farmers rapidly but it has also led to the decrease of the groundwater table at an alarming rate. Farming has become non-substantial for the future generation.

K. Tap Water with High TDS (Ground water) value preferred for drinking

As we talk of western Rajasthan, where different sources are used for irrigation purposes, we have inferred and come up with our results. The regions of Western Nagaur has comparatively higher TDS of water at a lower depth. For example, Barani has 1500 TDS of ground water which is at 200-400 ft depth. Due to proximity to IGC canal, some regions like Nathusar village of Bikaner, have recorded an increase in water table and also decrease in TDS of groundwater whose depth is approximately 50 feet .Besides, some regions have been declared **"Dead Zone"**, by the government, like Chowkri Kalan in Jodhpur, as the water table has decreased drastically

and also no further installation of tubewells are allowed. On the other hand, some villages like Nedayi are totally dependent on IGC water and use of groundwater is for intensive agriculture. Here the tanker rates are comparatively lower with 300 rupees per tanker. As there is close proximity to IGC, pipelines must be installed so that IGC water is also available for irrigation purposes. In contrast to this. The Bhil people of Thaiyat village, which is very small and far deeper into the desert, are deprived of IGC water.

Table. 6. TDS and groundwater depth in western Rajasthan.

District	**Village**	**TDS**	**Groundwater Table Depth (feet)**
Jaisalmer	Thaiyat	880	350→400+
	Nedayi	Not use of ground water(use of igc)	200+
Jodhpur	Chowkri Kala	1800	70→350+
Nagaur	Beetan	1680	200→550+
	Subhdand	No use of ground water	1000+
	Deepura	800	200→450
	Barani	1500	200→400
	Nimbdi	700	250→450
Bikaner	Badhnu	800	400→800
	Nathusar	300	300→250+
	Kharda	800	400→1200+

Tankers here are also comparatively costlier with 800 rupees per tanker.They avail water from a government installed tube well with TDS 800 for drinking as well as other household purposes. The areas of low TDS are the areas(nedayi, subhdand, nathusar) where rainwater harvesting is done or the use of local nadi is still present. Their TDS value is around 200.

Photo. 6. High TDS of Ground water in Barani, Nagaur.

Table.7. Source of Water

District	Village	Rooftop water harvest	Common water body	IGC
Jaisalmer	Thaiyat	little	yes	N.A.
	Nedayi	Not practiced	no	Major source
Jodhpur	Chowkri Kalna	Not practiced	no	available
Nagaur	Beetan	Least practiced	yes	N.A.
	Subhdand	practiced	yes	N.A.

	Deepura	practiced	no	N.A.
	Barani	practiced	yes	N.A.
	Nimbdi	practiced	yes	N.A.
Bikaner	Badhnu	Not practiced	no	N.A.
	Nathusar	Not practiced	no	available
	Kharda	Not practiced	no	N.A.

If we talk about rainwater harvesting practises and water sources of Western Rajasthan,we conclude that, In Bikaner, the concept of rainwater harvesting is not at all implemented as there is heavy dependence of ground water and in some villages, there is pure access and availability of IGC water, which has resulted in the lowest levels of water tables. Thus, the awareness rate here is very naturally lower. Contrast to this is Nagaur, where rainwater harvesting is practiced at a very higher rate as the groundwater quality is poor and unsuitable for usage. Moreover, people here have no access to IGC water. Common water bodies are used due to poor quality of ground water. As rainfall recorded here is more, rainwater harvesting is extensively practiced here. Coming to Jodhpur, we observe that here there is no rainwater harvesting due to scarcity of rainfall. Also, the people here have access to IGC water. In Jaisalmer, areas which are close to IGC like Neyadi, do not practice rainwater harvesting. But areas like Thaiyat, which far away from IGC and do not use groundwater due to poor quality practice rainwater harvesting. Here, common water body is used only for livestock purposes. So, here, rainwater harvesting is practiced at a relatively higher rate.

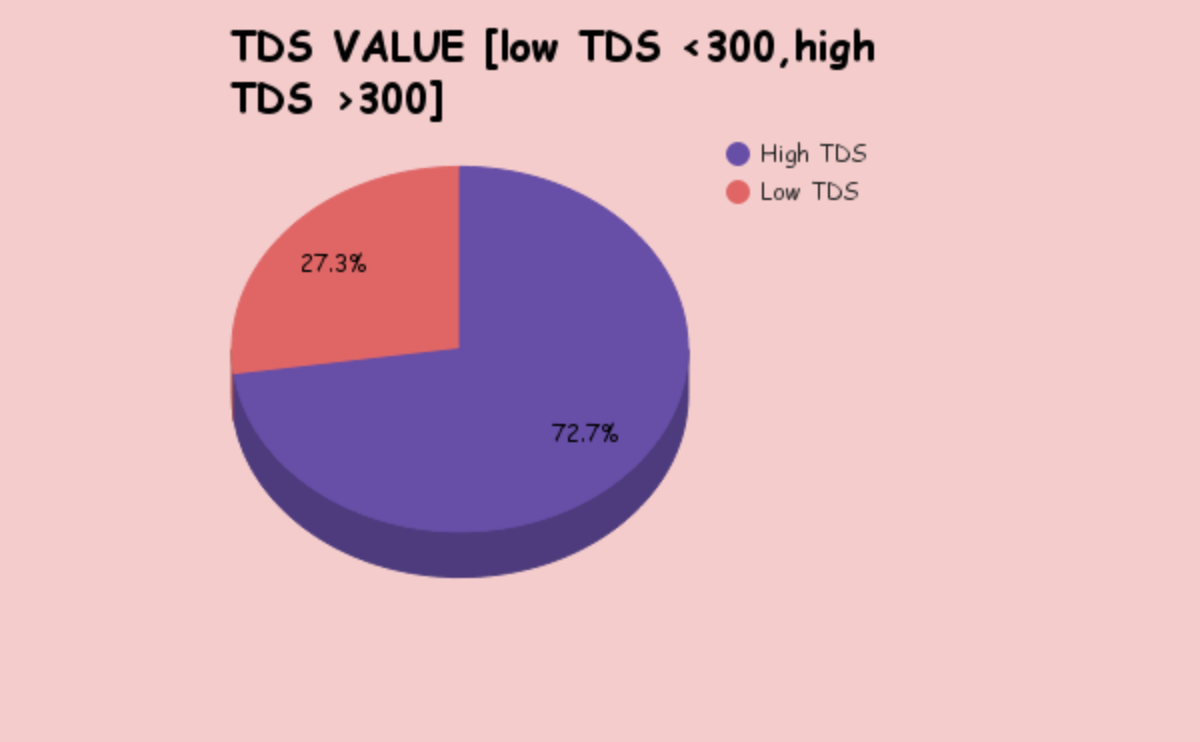

Figure . Permissible TDS value of households drinking water in Percent.(Based on survey)

Photo.9.Indira Gandhi Canal, Jaisalmer.

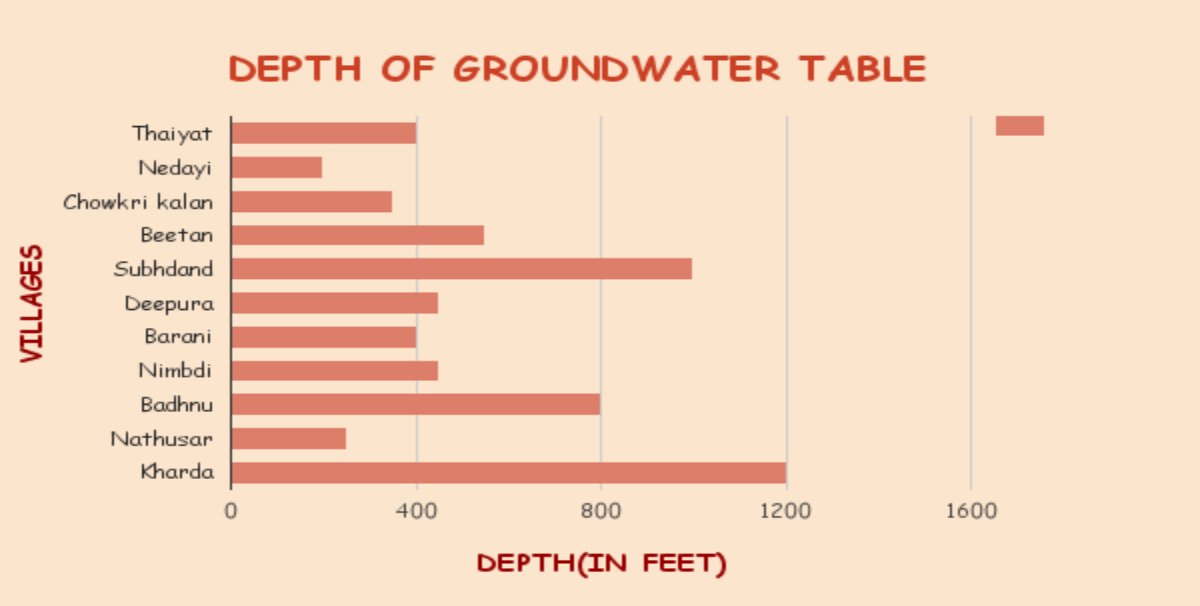

Figure. Depth of Ground water.

From this data we can easily find that the areas near the igc have had their underground water table recharged hence their water table is comparatively high. The region which do not have any approach to IGC have water table very low (badhnu,kharda) due to their excessive pressure on underground water table for intensive agricultural practices.

L. Decreased crop productivity with increased ground water irrigation

Since net sown area has increased rapidly in the current past because of the assured irrigation facility provided by the submersible pumps. Over the time with continuous discharge of ground water by submersible pumps depleted the ground water table and simultaneously with increasing depth the TDS value and sodacity of water also increased tremendously. The continuous irrigation by increased TDS value of water deceased the crop productivity and increased the pH value of the soil. In Bikaner district, the productivity of the ground nut crop decreased from 25 Quintal per hectare in 2003 to 15 Quintal per hectare in 2016. It was also investigate that in khwaspura and chokri kala village in Jodhpur district, the productivity of chilly in arable land is reduced to zero. With increasing investment on farmland farmers are getting diminishing return.

M. **Use of sprinkler over drip irrigation.**

In places like Rajera (Bikaner),due to uneven topography, drip irrigation is not possible here. If we work on the topography of this area and make it even, it will cost a lot which is unaffordable by the villagers. Also technical backwardness does not allow drip irrigation in this region. The kind of crops grown by the farmer nowadays also hamper the use of drip irrigation, as the farmers are growing cotton (for maximum profit), is a water intensive crop and it is grown over a large area so drip irrigation is costly and no one has such financial power to afford it. Thus after experimenting the drip irrigation in the region the farmers have switched back to sprinkler system.

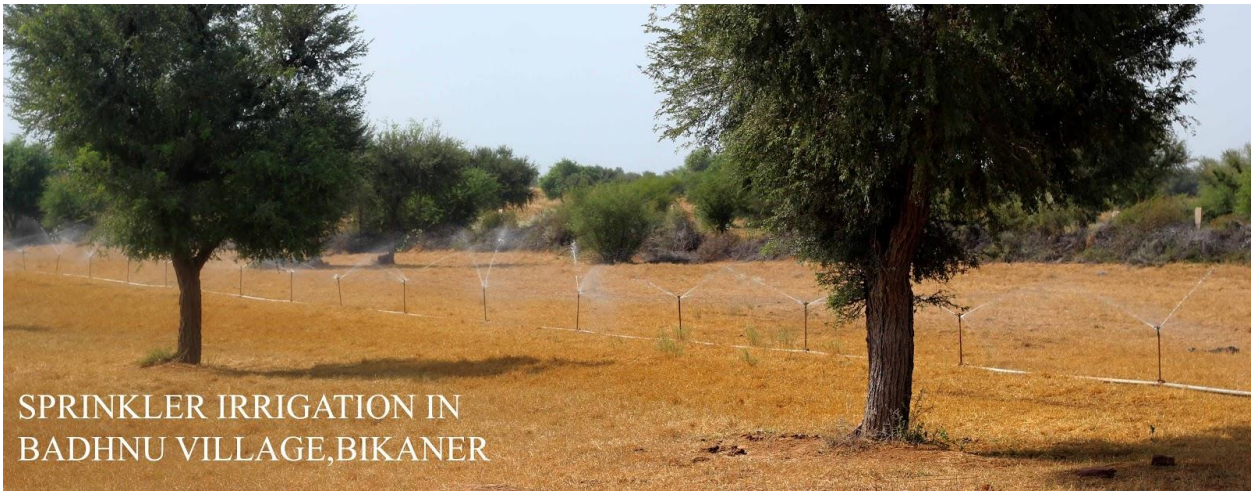

Photo.10. Sprinkler Irrigation in Bashnu Village, Bikaner.

N. **Use of IGC water as secondary choice**

IGC water is used as a secondary choice because there are organic impurities in the water which makes it unsuitable for drinking purposes for example IGC water in Barani was the chief reason for the cause of jaundice. Moreover, limited and insufficient supply of water results in its secondary use.

Along with this the canal is uncovered so the accidental cases during fetching the water is a common problem and people living in the nearby areas also dispose off their waste into the canal which ultimately leads to the water contamination.

O. **Effects of contaminated water**

People of Western Rajasthan face many problems and ill effects of using hard water. First of all is the effect of fluoride present in water. Other than this, hard water results in joint pains, tooth

decay and yellowing, thinning, whitening and greying of hairs. Besides, diseases such as jaundice, typhoid diarrhoea , kidney and gall bladder stones are also prevalent in this areas. Weak immune system, imbalance of hormones, joint imbalances, skin diseases, early aging and many intestinal diseases are also found in this regions caused due to consumption of hard water.

P. **Lack of awareness**

People here are not knowledgeable or educated enough. On top of this the elders have not passed their knowledge and previous activities of water conservation. Also the elders have not made the younger generation realize the importance of water as they were born in the prime phase of water (tubewell era). So there is no awareness about condition of water, techniques of water conservation and benefits of conservation techniques and aftereffects of using current contaminated water. Also most of the people are unaware of the fact that the water is present in a limited quantity under the earth surface.

Q. **Lack of people's will**

In many places such as Badnu and Tharusar of Bikaner,people don't practise rainwater harvesting or any other conservation techniques due to their lack of willingness and interest towards conservation of water as the unlimited water if available via tube wells. They are quite at leisure and have casual thoughts about water which leads to their unwillingness as well.

Photo. 11. Govt. fitted taps to supply tubewell water in Badnu.

R. **Proper drainage missing**

In a few villages the drainage system was either lacking or not maintained. Where the drainage system was lacking all of the dirty used water was spilled all over the roads. The unmaintained drainage system had the same scene but it also had the stagnant water in the drains. Negative effect of this condition:-

1. Breeding ground for disease causing mosquitoes and other insects.
2. Source for in home water borne disease.
3. Main cause of foul smell.
4. Mar of the aesthetic values of the area.

No efforts were being made by the locals or even the government to rectify this problem.

Photo.12. open drainage in village Inderpura, Didwana.

S. **Taps**

Tap Water is provided to the villages near to IGC and these tap points are common for all community but taps which become a lifeline are ordinary ones.Water is running out through tap even after it is closed.We find this problem in Thanu and in some other villages also. By an estimate a leaking tap waste around 5500 liters of water per year.Some special kind of tap like Nozzle tap, can solve this problem and conserve the every precious drop of water in a condition where it matter most.

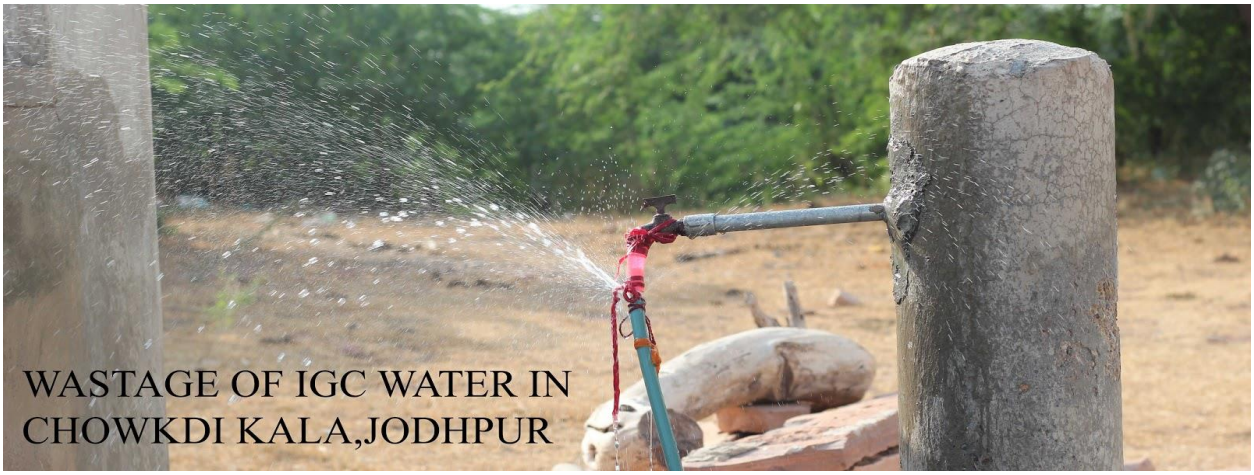

Photo.13. wastage of IGC water in Chowkdi Kala, Jodhpur.

8. Innovations shown by the Project

Prospects of the Project

A. **Regenerate the disappearing channels of the river in the region**.

Since most of the seasonal monsoonal rivers lost their course and catchment due intensification of farming and quarrying/ mining activities in the region. There is instant need to rejuvenate the catchment and the course of the river by providing safe channels and removing the encroachment. For example Khwaspura region in Jodhpur district, the mining activities are so rampant and widespread which completely encroached the course of Jojri river where river lost its identity in last decade.

B. **Build check-dam on the periphery of the hilly region**

To collect the rain water through micro level local streams there is a need to construct the check dams on the circum margin of the hillocks in the zone of impermeable rocks. It will enhance the micro level watershed management and rainwater will be available round the year for the consumption of irrigation and drinking both. Currently a few hillocks have partial water catchment earthen check dams which increased the green foliage at local level.

C. **Ensure the catchment and channels of convectional Nadi/pond**s

Most of the local convectional (earthen and cemented) water bodies have lost their catchment due to agricultural intensification, human habitation and allied economic activities. There is immediate need to reinstate the common land and catchment in accordance to natural flow of the region. Micro level small channels which supply rainwater to the pond are blocked or encroached in the region because of the absence of ownership and revenue records. Framers either constructed a wall around there fields or develop the earthen embankment which disrupts the catchment of the pond. Subsequently, most of the conventional water bodies could not find substantial water as per their capacity and need of the village habitation.

D. **To supply the treated Canal water for drinking**.

The canal water should be properly treated before it supply to the villages and also aware the people about the treatment process. So without any hesitation they can use canal

water for drinking purpose. Awareness programme should be launched simultaneously about the health benefits of the canal water. Currently, local folks are hesitant in consuming the canal water as it carry dead bodies of animals and humans.

E. **Community participation for maintenance and preservation of ponds**.

There should be involvement of locals and panchayats for the maintenance of traditional common water bodies and to ensure potable water quality in the villages. For example kharda village in Bikaner district where people are drinking high fluoride ground water though in the presence of un-maintained common traditional water body. In village Beeten, Nagaur through community participation, they manage to construct a barbed wire in a common land for the catchment of a nadi which supply potable water to the entire village for 8 to 10 months in a year.

There is a need to supply potable water to every household through pipeline which supply better quality of water then the ground water quality. The existing supply of ground water through pipelines to every household indirectly forced the locals not to maintain the traditional water bodies. Thus the sense of maintenance of traditional water bodies lost its significance.

F. **Introduction of plants suitable to climate**.

Hydrophyte/ tropophyte plants and trees should introduced in the water bodies and its periphery to reduce the evaporation rate. It will increase the biomass and carrying capacity of the region.

G. **Minimization of evaporation**

To check the evaporation in the water bodies a green sheet/ solar photo voltaic panel should be introduced over them. The solar panels will to minimize on these rainwater harvesting bodies and also generate the electricity for personal consumption.

H. Preservation of impervious layer of soil in Nadi / Ponds

The soils of Rajasthan is porous due to the lack of silt and clay content. There is missing link of knowledge and implementation for deepening the conventional water bodies in the village by MNREGA. As its plan to deepen the natural water bodies it results in the removal of the top silt/clay layer of the water body which make the body porous and reduce the water retention capacity. Resulting it even after greater depth and capacity of pond it could not retain water more than 4 to 5 month. While the traditional water bodies where MNREGA work has not been done retain the water for 8 to 9 month as it carry its impervious layer intact. Therefore impervious layer of soil should be maintained either by clay layer or by plastic layer.

I. Transgenic crops which require less water be introduced

In a water deficit western Rajasthan farmers used to grow water intensive crops for maximization of their profit. It further accelerate the acuteness of the problem of water scarcity. Therefore there is immediate need of transgenic crops to be introduced in the region which require minimum water and give substantial economic return. Currently, farmers used to grow water intensive crops such as cotton, ground nut, chilies and onion etc. which all of them are cash crops.

J. **Economically feasible agricultural infrastructure for water conservation**

The exorbitant cost of water conservational agricultural infrastructure keep the poor and small farmers away from using them. To make the easy availability of sprinkler and drip irrigation system to the local masses will reduce the water consumption for irrigation. As of now due to poor economic conditions farmers are not able to facilitate even after subsidized rates of conservational irrigation mechanism.

K. **Need to introduce the drought resistant crops**

Since agricultural irrigation system is the largest consumer of water and responsible for rapid depletion of ground water therefore there is urgent need to shift the farmers cropping methodology from flood/ carpet irrigation to drip and sprinkler irrigation like Alovera, cauliflower, brinjal, lemon and horticultural crops which are suitable for the arid and semi-arid climatic conditions.

9. Conclusion

- **Dependency on rainwater harvesting is decreasing rapidly.**
- **Shift from dryland farming crops to water intensive crops.**
- **Widespread dependency on ground water for drinking and irrigation purpose.**
- **Depletion of the traditional common water bodies.**
- **Introduction of submersible tube wells are depleting ground water table rapidly.**
- **Cropping pattern shifted from food grain crops to cash crops.**
- **Seasonal rivulets and rivers are losing the identity due to depleting catchment.**
- **Dependency on Livestock is increasing from farming and horticulture.**
- **Depleting ground water table increases the TDS value and sodacity.**
- **The productivity of the crops are decreasing with increasing pH value.**
- **The community participation for water conservation is getting minimized.**
- **Ground water with increasing depth is decreasing the capacity of the soil.**
- **Settlements are shifting from river margin (lost rivers) to road sides.**
- **Introduction of Hods started depleting the ground water table alarmingly.**
- **Rampant and regular rural to urban outmigration of male working youth force.**
- **Carrying capacity of the rural area is decreasing with modern technology.**
- **Dependency on ground water increases the health hazards in the region.**
- **The piped ground water supply for drinking deviated from rainwater harvesting.**
- **Missing link among masses about the quantity, quality and usages of water.**
- **Ground water as common resource is probe to depletion at rapid pace.**
- **Non visionary action programme of MNREGA depleting the traditional ponds.**
- **Conservative attitude of water get depleted with the introduction of tanker supply.**

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11. Publications from the work

1. Water Management in Western Rajasthan, DU Journal of Undergraduate Research and Innovation, Volume 2, Issue 2 pp 165-171, 2016. ISSN: 2395-2334 .

2. Implications of technology in water management: A case study of western Rajasthan, North Asian International Research Journal of Multidisciplinary ISSN: 2454 - 2326 Vol. 2, Issue 5 May 2016.

12. Conference / Presentation

Eco Club Shivaji College

NATIONAL SEMINAR ON WATER AND AIR QUALITY IN URBAN ECOSYSTEM

(University of Delhi)

Certificate of Appreciation

This is to certify that Dr./Mr./Ms. Bharat Ratnu of Shivaji College, University of Delhi has participated/presented Poster titled Smart cities and water problems : A case study of Ajmer in the *"National Seminar on Water and Air Quality In Urban Ecosystem"* held at Shivaji College, University of Delhi, Raja Garden, New Delhi, on 22nd March 2016.

Vijay

Dr. Vijay Kumar
Organising Secretary

Nijhawan

Dr. Shashi Nijhawan
Principal

11.Media Coverage

During Field visit SHC 315 Innovation team interacting with the Sahara News and DD News Media at Deep pura village, Nagaur District, Rajasthan.

फेर

रूवटिया, पूर्व
सुरेश वर्मा एवं
णमुरारी सर्राफ तथा
वरमल रैगर भी

प्र.). मेड़ता कृषि
षक प्रतिनिधि पद
कर शुक्रवार शाम
ाल मीणा की
आरक्षण लॉटरी
डीएम मीणा ने
वार्ड 1 एसटी
र्ग, 3 सामान्य
5 सामान्य
ान्य महिला,
र्ग एवं वार्ड
के लिए
के पर कृषि
ध सिंवर,
अध्यक्ष
ति उप
दावड़
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दिल्ली यूनिवर्सिटी की टीम पहुंची कुचामन

पानी पर किया जा रहा है रिसर्च, जल संग्रहण के लिए दी जा रही है जानकारियां

कुचामन के निकट ग्राम दीपपुरा में ग्रामीणों से पानी को लेकर जानकारियां जुटाती दिल्ली यूनिवर्सिटी की टीम।

कुचामनसिटी @ पत्रिका. निकटवर्ती ग्राम दीपपुरा में शुक्रवार को दिल्ली यूनिवर्सिटी की टीम ने जल संरक्षण पर रिसर्च करने के साथ ही ग्रामीणों से पानी के बारे में जानकारी जुटाई। यूनिवर्सिटी के प्रोफेसर एवं टीम लीडर भरत रत्नु के नेतृत्व में पहुंचे छात्र-छात्राओं ने ग्रामीण क्षेत्र में वर्षा जल संग्रहण को लेकर जानकारियां जुटाई। टीम ने ग्रामीणों से पानी की उपलब्धता एवं बारिश के बारे में भी जानकारियां साझा की। रत्नु ने बताया कि टीम पूरे जिले के दौरे पर है। इस दौरान नागौर जिले के ग्रामीण क्षेत्रों मे जल संरक्षण पर रिसर्च किया जा रहा है। रिसर्च में जल संरक्षण की संभावनाओ को तलाश करने के साथ ही ग्रामीणों को जल बचाने के साथ बरसात के पानी को संरक्षित करने के लिए भी जागरूक किया जा रहा है । टीम रिसर्च करने के बाद जल से जुड़ी समस्याओं को केन्द्र सरकार तक पहुंचाएगी। रत्नु ने बताया कि जिले में फ्लोराइड से सर्वाधिक प्रभावित क्षेत्र बांक।पट्टी है। जो डीडवाना, मकराना, मेड़ता, डेगाना व जायल के कुछ क्षेत्र को प्रभावित करती है। जिसमे 200 से ज्यादा गांव फ्लोराइड की समस्या से पीड़ित है। टीम के सदस्य ग्रामीणों को बरसात के पानी को जमा कर प्रयोग मे लेने की अपील कर रहे है ताकि फ्लोराइड के कहर से बचा जा सके। नागौर जिले का दौरा करने के से पूर्व यह टीम जोधपुर, जैसलमेर और बीकानेर मे भी ग्रामीण क्षेत्रों का दौरा कर चुकी है। टीम ने शुक्रवार को ग्राम खारिया, दीपपुरा गांवों का दौरा किया। उन्होंने डीडवाना, मकराना और जायल तहसीलो के गांवो में भी दौरा कर वहां ग्रामीणों को वर्षा जल संरक्षण को लेकर जागरुक कर इसके लिए संभावनाएं भी तलाश करेगी।

Rajasthan Patrika newpaper (Hindi Daily) dated- 7-10-2016.

जल संरक्षण को लेकर किया जाग्रत

कुचामन सिटी। शहर के दीपपुरा ग्राम पंचायत में शुक्रवार को दिल्ली से आये डी.यू. यूनिवर्सिटी से सम्बन्धित शिवाजी कॉलेज की 10 सदस्यीय टीम ने गांव में जल संरक्षण को लेकर जगह-जगह ग्रामीणों तथा गांव की विद्यालय के छात्र-छात्राओं को जाग्रत किया। इस टीम में सहायक आचार्य भरतरबु के साथ ग्राम दीपपुरा में पानी को बचाने के बारे में ग्रामीणों को जानकारी प्रदान की तथा बताया कि आधुनिक दौर में कुओं तथा ट्यूबैल से सबमर्सीबल पम्पसेट से जो पानी निकाला जा रहा है उसके कारण पानी का फिल्यूल में बहुत अधिक दोहन हो रहा है जिसके कारण वर्तमान समय में राजस्थान के साथ-साथ कई राज्यों में पानी की भयंकर किल्लत चल रही है। टीम ने स्कुली बच्चों को बताया कि अपने घर में पानी का संरक्षण करने के लिए पानी को फिल्यूल में नहीं गंवायें तथा जितनी जरूरत हो उतना ही काम में लेवें। इससे पूर्व दिल्ली से आई टीम ने जैसलमेर, जोधपुर, बीकानेर तथा अब नागौर दौरे पर अपना काम कर रही है जिसमें कुचामन पंचायत समिति के ग्राम खारीयां में विद्यालय के अध्यापकों व बच्चों को पानी बचाने व संरक्षण करने के लिए कहा की एक टीम के रूप में काम कर जनता को इस तरफजाग्रत करे जिसके कारण भविष्य में पानी के लिए जूझना नहीं पड़े।

Danik Bhaskar, Nagaur, (Hindi Daily) dated 8-10-16

विद्यार्थियों ने जानी पानी की स्थिति

जल स्थिति पर शोध करने दीपपुरा पहुंचे दिल्ली के शोधार्थी

न्यूज सर्विस/नवज्योति, कुचामनसिटी

ग्रामीण क्षेत्र की जल संरक्षण एवं जल समास्याओं पर शोध करने के लिए दिल्ली विश्वविद्यालय से सम्बद्ध शिवाजी महाविद्यालय के विद्यार्थियों का एक दल शुक्रवार को समीपस्थ ग्राम दीपपुरा पहुंचा। सहायक आचार्य भरत रलू के निर्देशन में आए दल के सदस्यों ने बताया कि उनका उद्देश्य पश्चिमी राजस्थान में जल की वास्तविक स्थिति एवं जल संरक्षण के तरीकों के बारे में जानकार लोगों को जागरूक करना है। दल की छात्रा रिंकल ने बताया कि उनका दिल्ली यूनिवर्सिटी में प्रोजेक्ट पर कार्य चल रहा है, जिसके तहत लोगों को जल संरक्षण एवं जल के बारे में बताया जा रहा है। विद्यालयों में एवं अन्य जगहों पर जागरूक शिविरों का आयोजन किया जा रहा है, जिससे लोग जल के प्रति जागरूक हो रहे हैं तथा जल का दुरुपयोग करने से बच रहे हैं। छात्रा निलाक्षी ने बताया कि राजस्थान में सब मर्सिबल पम्प के कारण जल दोहन ज्यादा हो रहा है तथा भू-स्तर गिर रहा है, जिससे आने वाले दिनों में पानी की भंयकर किल्लत हो सकती है। छात्रा श्रीनवंति एवं कल्पना ने बताया कि दल ने राजस्थान के जोधपुर, जैसलमेर, बीकानेर एवं नागौर क्षेत्र का दौरा किया है, जहां वास्तव में जल की बड़ी समस्या है। छात्र-छात्रा धृष्टि, पारस, मुनीश, रजनीश ने बताया कि उन्होंने शुक्रवार को खारड़िया, नाका बस्ती, आसरवा एवं दीपपुरा के लोगों से मुलाकात कर जल संरक्षण के महत्व समझाया। दल प्रधान ने बताया कि इनका यह कार्य जब समाप्त हो जाएगा तब वे इस कार्य की रिपोर्ट राज्य सरकार, केन्द्र सरकार एवं यूनिवर्सिटी में जमा करवाएंगे, जिससे सरकार को धरातल पर वास्तविक जल समस्या के बारे में पता चल सकेगा। यह कार्य एसोसिएट प्रोफेसर तेजवीर राणा एवं प्रोफेसर के के शर्मा के निर्देशन में किया जाएगा।

कुचामनसिटी। ग्राम दीपपुरा में जल संरक्षण एवं जल समास्याओं पर शोध करते दिल्ली के विद्यार्थी। -हेमराज,पारीक

Danik Navjyoti in Deeppura village, Nagaur District, Rajasthan dated- 7-10-16.

02

YOUTH TODAY

पंजाब केसरी
दिल्ली/जयपुर
मंगलवार, 23 अगस्त, 2016

राजस्थान को पानी का पाठ पढ़ाने निकले

दिल्ली विश्वविद्यालय के आउटरिच प्रोग्राम के तहत पिछले एक साल से शिवाजी कॉलेज के बच्चे भूजल की वस्तुस्थिति और जल संरक्षण पर पश्चिमी राजस्थान के सुदूर इलाकों में पसीना बहा रहे हैं। किरोड़ीमल कॉलेज के एसोसिएट प्रोफेसर कौशल शर्मा की मेंटरशिप में इस प्रोग्राम के को-ऑर्डिनेटर और शिवाजी कॉलेज के एसोसिएट प्रोफेसर राजबीर सिंह राणा ने भूगोल और जीव विज्ञान के तृतीय वर्ष के 10 छात्रों का ग्रुप बनाया। इसमें 6 लड़कियां और 4 लड़के थे। इनसभी ने जैसलमेर, जोधपुर और नागौर जिले में 8-8 दिन के कई कैम्प किये और सुदूर गांवों में जाकर भूजल की वस्तुस्थिति और जल संरक्षण का पता लगाया।

महज 4.5 लाख के बजट से पिछले शैक्षणिक सत्र में शुरु हुए इस प्रोग्राम में हर जिले के अनुरूप छात्रों ने करीब 300 सवालों की सूची तैयार की। इन सवालों के उत्तर जानने के लिए हर छात्र को एक परिवार के साथ कई घंटे समय बिताना पड़ता था। इस सर्वे की खास बात यह है कि इसमें केवल प्रश्नों के उत्तर नहीं पूछे जा रहे थे, बल्कि उस परिवार के साथ रहकर उनके दिनचर्या से उन प्रश्नों के उत्तर पता करते हैं। ग्रुप का हिस्सा रहे छात्र बताते हैं कि दिल्ली और राजस्थान के जलवायु में काफी अंतर है, इसके अलावा वहां की भाषा ने हमारे काम को काफी कठिन बना दिया था। सर्वे ने काफी चौंकाने वाले तथ्य जमा किए हैं। इनके अनुसार पिछले 25 वर्षों में पश्चिमी राजस्थान में भूजल की स्थिति में काफी गिरावट आया है। जोधपुर के चौकड़ी कलां में 280 फीट, तो नागौर के बीटन में 350 फीट, जैसलमेर के नेडई में 200 फीट तक की गिरावट आई है। प्रोग्राम को-ऑर्डिनेटर राजबीर सिंह बताते हैं कि इस गिरावट की वजह है भू-जल का जबरदस्त दोहन। खेती में खाद्यान्न के बदले ज्यादा पानी की खपत वाले नगदी फसल उगाने से अब अमूमन हर खेत में एक बोरवेल होता है। टैंकर से सहज पानी उपलब्ध होने की वजह से पहले जहां लोग खाट पर बैठ कर नहाते थे और नीचे गिरे पानी को इकठ्ठा कर जानवरों को नहलाते या पिलाते थे, अब पानी की बर्बादी की वजह से गलियों में कीचड़ हो जाता है। साथ ही वर्षा जल संरक्षण भी लगातार कमतर होता जा रहा है। जानकारी के अभाव में मनरेगा जैसी स्कीमों में भी नाड़ीयों (पुराने तालाब) को गहरा करने के नाम पर ऊपरी मिटटी पर जमे चिका मिटटी (पानी रोकने वाली मिटटी) को हटाया जा रहा है। अगले एक साल में कुछ और जिलों में सर्वे करने के बाद इसके नतीजों पर राजस्थान सरकार को सुझाव भेजे जायेंगे, ताकि भूजल के गिरते स्तर को रोका जा सके।

- विकास कुमार

आपके आइडिया को बड़े बिजनेस का स्वरूप देगा फाउंडर कैफे

वैभव भल्ला और उनके कुछ दोस्त भी एक अनोखे आइडिया के साथ एक्सपो में चर्चा बने हुए है। वैभव भल्ला ने अपने दोस्तों के साथ मिलकर फाउंडर कैफे नाम से एक कंपनी को शुरू किया है। जो कि नए युवाओं के बिजनेज आइडिया को पूरा करने में मदद करता है। कंपनी के सह संस्थापक वैभव भल्ला बताते है कि आजकल हर युवा के मन और दिमाग में रोजाना कुछ नया करने के चल रहे होते है। लेकिन 2-3 फीसदी युवा ही ऐसे होते हैं कि अपने दिमाग को आगे तक ले जाते हैं। कई लोगों के पास संसाधन की कमी होती है तो कई को आगे बढ़ाने की समझ नहीं होती। जिसकी वजह से लोग अपने आइडिया को आगे ले जाने के लिए काम नहीं कर पाते हैं। भल्ला ने कहा कि हम ऐसे ही युवाओं की मदद करते हैं जिनके पास कुछ करने का जज्बा है और कुछ कर दिखाने की तमन्ना।

बिजनेस आइडिया को पूरा करने में मदद करने का काम कर रहे हैं युवा

भल्ला ने बताया कि वह आइडिया लेकर आने वाले लोगों के आइडिया पर काम करने के लिए पूरी मदद करते हैं। इसमें उन्हें ऑफिस और टीम भी उपलब्ध कराते हैं। इसके साथ ही बिजनेस को शुरू करने की सभी तकनीकी चीजों में भी मदद करते हैं। इसके साथ ही आइडिया के लिए फंड इकठ्ठा करने में भी मदद करते हैं। वहीं प्रचार और प्रसार भी करने मार्केट में ले जाने की मदद भी करते हैं, जिससे कोई भी

Punjab Kesari, Delhi and Jaipur, Dated- 22-08-2016.

Photos:

Mining area in Khatu, Nagaur.

Un-proper drainage in Asarwa village.

Sprinklers in Badhnu, Bikaner.

Water conservation along the road.

Students interacting with the local masses in the Naka Basti.

Un-maintained Nadi in Kharda, Bikaner.

Maintained pond in Barani village, Nagaur.

Water motor suck water from pond for drinking purpose.

Students interacting with local folk in tribal village, Thaiyat, Jaisalmer

Dr. T.S Rana, interacting with the tribal women in Thaiyat village, Jaisalmer.

Unproductive cattle over-crowding on the road.

Annexure / Questionnaire

Inventory and prospect of water conservation in Western Rajasthan.

QUESTIONNAIRE SHC 315

A. Basic Information

1. District ……Tehsil……..Village……..H.H. No……..
2. Head of the Family…….....
3. Category: General…….OBC…….SC…….ST…….
4. **Structure of Family**

S. No.	Name	Sex	Age	Education	Occupation	Other

5. Approx. Monthly Income……. Bank Account : Yes …… No …….
6. Migration: Member ……

   Purpose……..

   Short term ……..….Long term……..…….short distance……..…...long distance……..…..

   Migration- Male ……. female…….family……...

7. House Type: metaled……Buildup Area (Sq. yd.)…….Un metaled……..

   Metaled house- Used for rooftop water harvesting:

   Yes…….No……..

8. Sanitation: Drainage facility Yes…….No……. (Drain water use in…….)

9. Toilet/ Washroom: Not in use…….. In Use……

   Hygienic…….

10. **Livestock:** Number……..

    Type……..

    No. and type Fluctuation (Seasonal):

    Reason…….

    Livestock diseases:

    Summer……Rainy……

    …….

B. Farm land

1. Land size……irrigated land……
2. Mode of irrigation: Carpet…….. Sprinklers…….…….drip irrigation……
3. **Agriculture: (Major Crops)**

1990's
Kharif…….

1990's
Rabi……

2016- Kharif…… ……..
……..

2016 -
Rabi……
…….

4. Water source at farm……depth: Tube well

   1990……..2016……..

C. Water Demand

S. No.	Water Use	Number	Water consumption/day	person/ day	Water Source
1	**Drinking**				
2	**Domestic purpose**				
3	**Livestock**				
4	**Agriculture (Bega)**				
5	**Other**				

A. Water Source

S. No.	Water use	Existing source normally used	Avg. distance from the sources	Water quality (suitable for which use)	No. of month (sources can be used in a year)	Alternate sources (during dry months)
1	**Drinking**					
2	**Livestock**					
3	**Household Sanitation**					
4	**Agriculture**					

A. Water Supply

1. On Head (from well/hand pump) ……..Tap……Tractor

   tanker……..other …….

2. Water fetching: time…….Distance…….. Male / female……**…**

B. Water Storage

1. Tanka……..capacity……..duration……..…….(in months)

2. Earthen pot……..cylindrical tank……..

1. Water stress months……

C. Purification process used

1. Sedimentation……..…Filtration..……RO/AG……other……..……

….

D. **Water Harvesting** (Size –yd^2)

Roof top……Circular tank…….Rectangular

tank……..

…….

E. Water conservation: Traditional means

…….

F. Water based govt. facility availed: Yes ……. No ……

Name……

G. Caste biasedness to avail water

……

H. Health hazard due to water

Water borne

disease……..

……

..

I. **Education effected due to fetching the water - Girl / Boy (Any gender biasness)**

……

J. **Marriage effected due to scarcity of water in the village.**

……

K. **Out Migration due to scarcity of water (which couldn't sustain livelihood)**

Remark

……...

L. **Women status (who handles / stores the water in household)**

- **Education Qualification**

  ……

- **Decision**

  making……

  ……..

- **Occupation……**

  ……..

- **Water sensitive (how recycle / reuse and conserve the water)**

  ……..……

  …….

M. **SUGGESTION:**

……

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……

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Tanka Capacity

District	**Village**	**Tanka Capacity(in litres)**
Jaisalmer	Thaiyat	8000
	Nedayi	12000
Jodhpur	Chowkri Kalna	10000
Nagaur	Beetan	8000
	Subhdand	10000
	Deepura	8000
	Barani	12000

	Nimbdi	15000
Bikaner	Badhnu	12000
	Nathusar	5000
	Kharda	10000

TDS(groundwater)

District	**Village**	**TDS**	**Groundwater Table Depth(feet)**
Jaisalmer	Thaiyat	880	350→400+
	Nedayi	Not use of ground water(use of igc)	200+
Jodhpur	Chowkri Kala	1800	70→350+
Nagaur	Beetan	1680	200→550+
	Subhdand	No use of ground water	1000+
	Deepura	800	200→450
	Barani	1500	200→400
	Nimbdi	700	250→450
Bikaner	Badhnu	800	400→800
	Nathusar	300	300→250+

	Kharda	800	400→1200+

Depth of Groundwater Table

District	**Village**	**Groundwater Table Depth(feet)**
Jaisalmer	Thaiyat	350→400+
	Nedayi	200+
Jodhpur	Chowkri Kalna	70→350+
Nagaur	Beetan	200→550+
	Subhdand	1000+
	Deepura	200→450
	Barani	200→400
	Nimbdi	250→450
Bikaner	Badhnu	400→800
	Nathusar	300→250+
	Kharda	400→1200+

Utilization Certificate

Innovation Project 2015-16
SHC – 315

Project Title Inventory And Prospectus of Water Conservation in Wstern Rajasthan

Audited Financial Statement under Innovation Project scheme

College: Shivaji College

Project Investigators: Dr. Tejbir Singh Rana, Mr. Bharat Ratnu, Dr. Sukhram

Grant Sanctioned Rs	Rs. 4,50,000/- (Rupees Four Lacs Fifty Thousand Only)		
	Grant Received	**Grant Utilized**	**Unspent Grant**
Equipments/Consumables	1,25,000/-	NIL	1,25,000/-
Travel	1,05,000/-	1,67,243/-	(62,243)
Stipend	1,20,000/-	1,20,000/-	NIL
Honorarium	25,000/-	25,000/-	NIL
Stationery	20,000/-	NIL	20,000/-
Contingency	55,000/-	44,801/-	10,199/-
Total	**4,50,000/-**	**3,57,044/-**	**92,956/-**
Total amount utilized	Rs. 3,57,044/- (Rupees Three Lacs Fifty Seven Thousand Forty Four Only)		
Amount remaining Rs. (In figures and words)	Rs. 92,956/- (Rupees Ninety Two Thousand Nine Hundred Fifty Six Only)		

Certified that out of **Rs. 4,50,000/- (Rupees Four Lacs Fifty Thousand Only)** sanctioned to Innovation Project Code **SHC-315, Rs. 3,57,044/- (Rupees Three Lacs Fifty Seven Thousand Forty Four Only)** has been utilized during the period of the project. The remaining amount **Rs. 92,956/- (Rupees Ninety Two Thousand Nine Hundred Fifty Six Only)** and is being returned back to the University.

Note : Over expenditure under the head "Travel" has been met from unspent balance in "Equipment" with prior approval from the Innovation Desk.

31/10/16.

1st Project Investigator

31/10/16

2nd Project Investigator

31-10-16

3rd Project Investigator

Principal

VIPUL DHAWAN & ASSOCIATES
CA
No. 518146
NEW DELHI
Chartered Accountants

University of Delhi

RC/2015/9435 31 August, 2015

The Principal,
Shivaji College
Ring Road, Raja Garden,
New Delhi-27

Subject: - **Innovation Projects 2015-16**

Dear Principal,

The University of Delhi is pleased to announce the third round of the undergraduate research initiative in colleges, Innovation Projects 2015-16. You will be glad to know that the following project submitted by your college has been selected for award

Project Code: SHC 315
Project Title: Inventory And Prospect Of Water Conservation In Western Rajasthan

The distribution of grant under different budget heads as below:

Sr. No.	Budget Head	Amount
1.	Equipment/Consumables	Rs 1,25,000/-
2.	Stipends	Rs. 1,20,000/- (1000x10x12)
3.	Travel	Rs 80,000/-
4.	Honorarium	Rs 25,000/-
5.	Stationery/Printing	Rs 20,000/
6.	Contingency	Rs 55,000/-
	Total	Rs 450,000/-
Rs 4.5 lakhs (Rupees four lakhs fifty thousand only)		
Amount to be released in first phase by Finance Branch- Rs 3,00,000/		

Budget head No. 1 and half of the remaining grant will be released as the first instalment. The second and final instalment will be released after submission of half-yearly report (by 15 February 2016), satisfactory review and recommendation of release of the second instalment.
Please refer to the detailed guidelines for implementation of the project. Any queries may be addressed to- innovationprojects1516@gmail.com.

With best wishes,

Yours sincerely,

Prof. Malashri Lal