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Socio Economic Impact of Water Harvesting Structures

Constructed by PHDRDF in Sikar District of Rajasthan

November 2015

PHD Research Bureau
PHD CHAMBER OF COMMERCE AND INDUSTRY

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Alok B Shriram

From President's Desk

Water is a valuable national asset and is the most important natural resource catering to the basic needs of human beings. However, with the increasing world population and diversely emerging economic activities, the problem of water scarcity is continuously growing.

Ground water depletion is a major challenge before world today. The escalating demand of water over the coming times is bound to lead to scarcity of ground water.

As more people put ever increasing demands on limited supplies, the cost and effort to build and maintain access to water will increase. In this light, it has become important to improve the efficiency of planning and management of water resources to ensure that scarcity of water resources does not hamper development of the economy.

Towards this end the PHD Rural Development Foundation (PHDRDF) had taken initiative of implementing Water Harvesting Projects in the State of Rajasthan nearly a decade ago in the water deficit rural areas which are semi- arid and mostly dependent on rain.

PHD RDF has been instrumental in uplifting the socio-economic status of the people in the district thus contributing to the all inclusive growth of the districts of Rajasthan. Economic effects of this initiative are going to be more visible in the coming times.

Going ahead, PHDRDF looks forward to working with more states for contributing to an all inclusive growth of the economy.

From Senior Vice President's Desk

Dr. Mahesh Gupta

A significant portion of the economy of Rajasthan is agrarian. Agriculture and allied sector forms the backbone of the state economy as about 80% of Rajasthan's population is dependent on agriculture for its livelihood.

In the district of Sikar, the daily exploitation of underground water for irrigation and domestic use purposes is very high as compared to its recharge, which results in depletion of water table.

Since the rainfall amount is very scanty and highly erratic, the expansion of irrigation provisions and efficient water management are major challenging tasks before the policy makers.

To ensure enough supply of water for drinking purposes and irrigation, rain-water harvesting through water harvesting structures in the state of Rajasthan, PHD Rural Development Foundation has implemented Community Based Lift Irrigation System (LIS) Project - first ever in Rajasthan, in the villages of Sikar district. In this endeavor, 84,105 families of 473 villages have been benefited.

The lakes and water harvesting structures that have come to life with the harvested water have proved to be a boon not only for the local residents but also for the entire ecology of the region.

Such strategic measures help rehabilitate degraded areas and preserve the ecological balance by checking aquifer degradation and surface water depletion to help flora, fauna and the wildlife.

From Vice President's Desk

Gopal Jiwarajka

On the socio economic front, the state of Rajasthan has of late shown a remarkable progress. The percentage of population living below the poverty line is estimated at around 15% at present which is well below the national average of about 22%.

About 25-30% of the population in semi-arid and water deficient rural area lives below the poverty line.

The much needed construction of water harvesting structures in the state of Rajasthan and Haryana has led to a widespread improvement in the socio-economic status of people. This has led to an overall increase in groundwater level. The water harvesting structures have facilitated increase in agriculture yield and productivity.

With the increase in the area under cultivation and irrigation, there has been an increase in crop production, which has boosted the income of the people. The income increase has helped farmers to increase their livestock, build pucca houses, pay off their loans and buy fertilizers, pesticides and tractors to facilitate their agricultural produce.

Further, there has been an improvement in the standard of living as well as child education in the villages. The women of the villages are of the opinion that the construction of water harvesting structures has improved their status as they are able to work in their own farms or find employment on others' farms and are able to contribute to their family income.

Saurabh Sanyal

From Secretary General's Desk

PHD Chamber has come up with a report on 'Socio-economic impact of Water harvesting structure'. The present study aims to analyse the socio economic impact of water harvesting structures on the lives of the people of Sikar district. The study provides valuable insights on how the water harvesting structures have proved to be a boon for the people, thus uplifting their socio-economic status.

I take this opportunity to express our gratitude and respect to our office bearers Mr. Alok B Shriram, President, Mr. Mahesh Gupta, Senior Vice President and Mr. Gopal Jiwarajka, Vice President for their constant support.

I express our sincere thanks to Dr. Kadambari, Director- PHD RDF for her profound suggestions and support in preparing the report.

I take this opportunity to express our thanks to Mr. Mukti, PHD RDF for providing us the relevant information for preparing this study. I would also like to thank Mr. Banwari Lal, PHDFWF for his support and our survey team.

I commend and appreciate the tireless efforts of PHD Research Bureau team led by Dr. S P Sharma, Chief Economist & Director-Research and Ms. Megha Kaul, Associate Economist and Ms. Huma Saif Qazi, Research Associate for producing this analytical study.

We would also like to place on record the services of Mr. Hariom Kuthwaria, Graphic Designer, PHD Chamber who collaborated in producing this work.

Contents

Executive Summary

A significant portion of the economy of Rajasthan is agrarian. Agriculture and allied sector forms the backbone of state economy as about 78% of Rajasthan's population is dependent on agriculture for its livelihood. The agricultural sector of the state accounts for 28% share in the state's GSDP.

On the socio economic front, the state of Rajasthan has shown a remarkable progress. The percentage of population living below the poverty line is estimated at 14.7% at present which is well below the national average of 21.9%.

In the district of Sikar, the daily exploitation of underground water for irrigation and domestic use purposes is very high as compared to its recharge, which results in depletion of water table. Consequently, much of the rain-flows in the rainy season after covering some distance disappear in the sandy fields. Since the rainfall amount is very scanty and highly erratic, the expansion of irrigation provisions and efficient water management are major challenging tasks before the policy makers.

As a part of its Corporate Social Responsibility (CSR) initiatives, the **PHD Chamber**, under the aegis of its Rural Development Foundation (RDF), undertook rain water harvesting through construction of water harvesting structures to help the farmers of Rajasthan. The objective of the present study is to evaluate the change in the socio-economic status of the people of Sikar district after the construction of water harvesting structures by PHD RDF.

The study aims to analyze the impact of construction of Lift Irrigation System by comparing the yields of villages which have Lift Irrigation Systems installed with those villages where the Lift Irrigation Systems are not yet installed. Further, the analysis also assesses the impact of water harvesting structures on the area under irrigation and cultivation, ground water recharge, income generation and livelihood of the people concerned, by comparing their economic status in the last 10 years, before (2004) and after(2014) undertaking the construction of the projects. The respondents comprise of village heads, villagers and builders of the Water harvesting structures.

The survey has revealed that after the construction of water harvesting structures there has been a significant change in the socio- economic status of the villagers. The inadequacy of surface water has made rain harvesting urgently necessary in the area. The respondents do not have to search for alternative sources of water now.

The water harvesting structures have significantly contributed to the increase in the groundwater recharge of wells in all the villages nearby the water harvesting structures. They have aided in increasing the productivity of land. The construction of these structures has increased the crop production as well as crop yield. With increase in crop production, the overall change in the crop pattern has been positive for all the villages.

The number of domestic animals has also increased in the villages after the construction of water harvesting structures as these have facilitated increase in income of the farmers thereby rendering greater propensity to spend. As the construction of these structures has led to an increase in agricultural productivity, farmers do not have to leave their villages in search of work in the nearby urban areas. Hence, the migration rate has also gone down significantly. With improvement in

agricultural output and spurt in economic activities, the income of the villagers has increased manifold.

New economic activities such as construction of houses, purchase of agricultural tools and machinery, repayment of loans, etc are some positive outcomes to the beneficiaries of the water harvesting structures.

The water harvesting structures have facilitated the access to ground water near it. In 2004, the ground water was around 200 ft (average) below for which the bore well had to be dug around 200 feet on an average to access ground water. However, after the construction of water harvesting structures, access to ground water has become easier near these structures. During the survey in 2014, it was revealed that ground water can be found at a level of 130 ft on an average near the water harvesting structures.

The water harvesting structures have facilitated agriculture in the villages, which is evident from the increase in area under cultivation. The average area under cultivation has increased from 221 acres per water harvesting structure in 2004 to 383 acres per water harvesting structure in 2014, posting an increase of around 73%. The irrigated area on the other hand has increased from 122 acres per water harvesting structure in 2004 to about 248 acres per water harvesting structure in 2014, registering an increase of around 103%. Further, there has been a substantial increase in average yield of major crops from 346 kg/acre per water harvesting structure in 2004 to around 818 kg/acre per water harvesting structure in 2014.

In addition, it was found that the villages where the Lift Irrigation System has been installed have witnessed higher agricultural productivity. The agricultural yield increased by 161% during the ten year period in villages with Lift irrigation system as compared to 111% increase in agriculture yield during the same period in villages which do not have Lift irrigation system.

During the course of the survey, the respondents have made various suggestions for the overall socio-economic development of Sikar district. The villagers are satisfied with the adequacy of water from water harvesting structures. However, they expressed their expectations of more developmental activities around the area. According to respondents, drainages and sewers need to be covered while clean drinking water tanks should be made available.

In addition, electricity should be provided and more schools and hospitals should be constructed. Also, the health and education facilities in the villages need to be improved. Spring irrigation, hand pumps and bore well should also be provided.

In a nutshell, the construction of water harvesting structures in Sikar is highly appreciable as there has been significant socio-economic development in the district. The construction of Lift Irrigation System has facilitated further increase in yield of crops and it is hoped that its expansion in other villages will further boost the productivity of the farms. The villagers look forward to further construction of water harvesting structures for inducing high socio-economic growth of the district as well as the state in the coming times.

1. Rajasthan Economy (Brief Overview)

Rajasthan located in North-West India, is the largest state of India. It is primarily an agrarian economy. The state has immense potential for electricity generation through renewable energy sources and wind power. Rajasthan is a suitable location for investments in sectors such as cement, IT and ITeS, ceramics, tourism, automotive and agro-based industries because of the availability of natural resources, lucrative policy incentives, strategic location and viable infrastructure. Tremendous opportunities exist in the areas of organic and contract farming as well as in infrastructure developments related to agriculture.

The World Bank in its report, Assessment of State Implementation of Business Reforms 2015, has placed Rajasthan on 6th Rank. The ranking has been done on different levels of implementation of the 98-point action plan. Rajasthan has an overall implementation status between 50% and 75% putting the state in the category of Aspiring Leader.

Over the last five years (FY11-FY15), the State has shown a decent rate of growth of around 8%, with a rapidly growing industry sector and services sector which has made it an attractive state for trade and investment. The real GSDP of the state has increased significantly from about Rs.213079 crores in FY11 to about Rs. 272227 crores in FY2015. The agriculture sector's share in Rajasthan's GSDP is about 28%; the industrial sector's share is about 27% while services sector's share in the state's GSDP has been recorded at 45%.

Exhibit 1.1: Gross State Domestic Product and its Composition

Components	FY2009	FY2012	FY2015
GSDP at current prices (Rs. crore)	230949	414179	574548
NSDP at current prices(Rs. crore)	203939	374089	516461
Economic Growth % (GSDP at constant prices)	9%	8%	6%
Sectoral Share in GSDP at current prices (%)			
Agriculture	24%	29%	28%
Industry	31%	29%	27%
Services	45%	42%	45%

Source: PHD Research Bureau, compiled from CSO

1.1 Agriculture Scenario of Rajasthan

A significant portion of the economy of Rajasthan is agrarian. The agricultural sector of the state accounts for 28% share in the state's GSDP. Agriculture and allied sector form the backbone of state economy. Around 78.4% of Rajasthan's population is dependent on agriculture for its livelihood.

Rajasthan state is the leading producer of coarse cereals, pulses, gram, seed spices and oilseeds. Agriculture sector in Rajasthan is largely rain-fed and only 39.5% of the total agricultural area is irrigated. Out of the total area irrigated, nearly 74% of the area is under wells and tube well irrigation. It ranks first in the livestock population in the country and third in terms of per hectare yield of Mustard.

Exhibit 1.2 Rajasthan: Summary of agro Statistics

Sr. No.	*Components*	*Growth/ratio*
1.	Population dependent on agriculture	78.4%
2.	Agriculture GDP at current prices(FY 2015)- (in lakhs)	15813297
3.	Growth of Agricultural GDP(Avg. from FY 2005- FY2015)	5.4%
4.	Agricultural sectors contribution in GSDP	28%
5.	Food Grain production(in thousand tonnes)	19751.7
6.	State's contribution to national food grain production	7.8%
7.	State's rank in food grain production (FY 2013)	4th
8.	Yield Kg/ Hectare(of total food grains) (FY 2013)*	1616
9.	Total agricultural area irrigated	39.5%
10.	Area under wells and tube wells irrigation	74.16%
11.	Rice production(in Thousand Tonnes)	366.7
12.	Wheat production(in Thousand Tonnes)	9868.7
13.	Coarse Cereals Production(in Thousand Tonnes)	7565.9
14.	Pulses production(in Thousand Tonnes)	1950.4
15.	Oil seeds production(in Thousand Tonnes)	5318.5
16.	Cotton production(Lint)- (in thousand tonnes)	1600
17.	Sugarcane production(in tonnes)	408.9

Source: PHD Research Bureau Compiled from RBI, MOSPI and Government of Rajasthan
*Note: * Fourth Advance Estimates, Department of Agriculture and Cooperation*

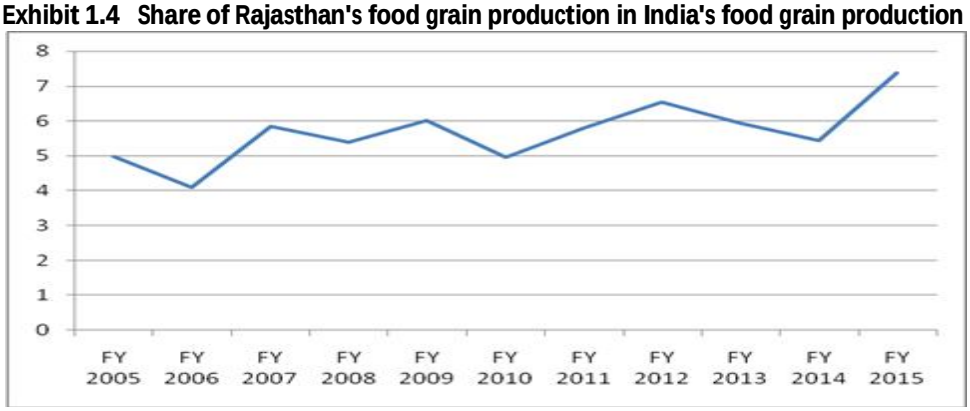
Exhibit 1.3 Foodgrain production scenario Rajasthan vis-à-vis India (in MT)

Year	Rajasthan	India	Rajasthan's share in India
FY 2005	12.15	243.53	4.99
FY 2006	11.45	279.8	4.09
FY 2007	14.21	242.89	5.85
FY 2008	16.06	297.5	5.40
FY 2009	16.68	277.19	6.02
FY 2010	12.35	248.81	4.96
FY 2011	18.83	324.79	5.80
FY 2012	19.47	297.98	6.53
FY 2013	18.36	309.39	5.93
FY 2014	17.8	327.49	5.44
FY 2015	19.7	266.74	7.39

Source: PHD Research Bureau, compiled from RBI, Ministry of Agriculture, GOI

Rajasthan's production of food grains has increased from 12.15mn tones in FY2005 to 19.7 mn tonnes in FY2015. Share of Rajasthan's foodgrain production in India's total foodgrain production has shown a fluctuating trend in recent years.

Exhibit 1.4 Share of Rajasthan's food grain production in India's food grain production



Source: PHD Research Bureau, compiled from RBI and Ministry of Agriculture, GOI

1.2 Socio Economic Scenario of Rajasthan

On the socio-economic front, the state of Rajasthan has shown a remarkable progress. The percentage of population living below the poverty line is estimated at 14.7% in 2011-12 which is well below the national average of 21.9%. The unemployment rate of the state for 2013-14 is 3.2%. The per capita income of the state is recorded at Rs. 72156 in 2014-15. The Infant Mortality Rate stands at 47per 1000 live births in 2013 which is higher than the Infant Mortality Rate at the national level of 40 per 1000 live births.

Exhibit 1.5 Socio-economic indicators: Rajasthan vis-à-vis India

Indicators	Rajasthan	India
Per-capita Income (FY2015)	Rs 72156	Rs 74380
Literacy (2011)	67.06%	74.04%
Poverty (2011-12)	14.7%	21.9%
Unemployment rate (2013-14)	3.2%**	4.7%**

Source: PHD Research Bureau, Compiled from various sources

*Note: **-Unemployment rate calculated on the basis of Usual Principal Status Approach*

1.3 Sikar District

1.3.1 Profile

Sikar district has a geographical area of 7,742.44 sq km spanning across 74°44'E to 75°25'E longitude and 27°27'N to 28°12'N latitude[1]. The maximum temperature in summer is 48 degrees centigrade; in winter, the minimum temperature is 1 degree centigrade; temperatures in summer months go very high, and the winters are very cold. The average rainfall is 459.8mm.

In the district, daily exploitation of underground water for irrigation and domestic use purposes is very high as compared to its recharge, which results in depletion of water table. Climatically this is better than other arid western plain regions like Bikaner, Jaisalmer Barmer, Phalodi, Shergarh, Osian and many other districts. Consequently, much of the rain-flows in the rainy season after covering some distance disappear in the sandy fields.

1.3.2 Socio Economic Structure

Demography

According to the 2011 census Sikar district has a population of 2,677,737, roughly equal to that of the nation of Kuwait or the US state of Nevada. This gives it a ranking of 150th in India (out of a total of 640). The district has a population density of 346 per square kilometre (900/sq mi). Its population growth rate over the decade 2001-2011 was 17.04%. Sikar has a sex ratio of 947 females for every 1000 males, and a literacy rate of 71.91%. The demographics of the district have been depicted in Exhibit 1.6.

The ranking of Sikar district in Rajasthan: Human Development Index (HDI) stands at 8 according to HD update of 2007 while on an overall ranking, the district stands at 0.698. The crude birth rate of the district stands at 23.5 while the crude death rate stands at 5.9. Infant mortality rate of the district according to the census of 2011 stands at 53 and under five mortality rate stands at 79 per 1000.

Exhibit 1.6: Demographic Profile of Sikar District

District	Total			Rural			Urban		
	Persons	Male	Female	Persons	Male	Female	Persons	Male	Female
Sikar	2677333	1374990	1302343	2043427	1047469	995958	633906	327521	306385
Rajasthan	**68548437**	**35550997**	**32997440**	**51500352**	**26641747**	**24858605**	**17048085**	**8909250**	**8138835**
Percentage	3.9	3.8	3.9	3.9	3.9	4	3.7	3.7	3.8

Source: PHD Research Bureau, compiled from various sources

1.3.3 Work Force Status

The total number of workers in Sikar district stands at 10, 06,504. The main occupation of the people is agriculture. The workforce participation rate of the district stands at 37.59%. Total workforce dependent and involved in agriculture either directly or indirectly is 87889 which are 8.73% of the total workforce. The workforce involved in agriculture has been depicted in Exhibit 1.7.

[1] Compiled from official web portal of Government of Rajasthan

Exhibit 1.7: Agriculture Labourers in Sikar District

	Agricultural Labourers (as per 2011 Census)					
	Person	% total workers	Male	% total workers	Female	% total workers
Total	87889	8.73	50605	7.69	37284	10.69
Rural	82408	9.99	46405	9.26	36003	11.11
Urban	5481	3.02	4200	2.68	1281	5.21

Source: PHD Research Bureau, compiled from various sources

1.4 Agriculture scenario

Agriculture and allied sector plays an important role in the district's economy. Major crops grown in the district are bajra, cluster bean, cowpea, moong, gram, mustard and barley. Agriculture forms the source of livelihood of the majority in the district. Since the rainfall amount is very scanty and highly erratic, the expansion of irrigation provisions and efficient water management are major challenging tasks before the policy makers. Only 45.10% of the net sown area is irrigated. The soil of Sikar is characterized as sandy loam and shallow depth red soils in depressions.

1.5 Need for the Water harvesting structures in Rajasthan with special reference to Sikar District

Rainwater harvesting is accumulation and deposition of rainwater for reuse on-site, rather than allowing it to run off. To ensure enough supply of water for drinking purposes and irrigation, rain-water harvesting through water harvesting structures in the state of Rajasthan has become a need of the hour. This method of rain water harvesting is an effective measure to reduce the problems of drought, dry wells and low levels of water table. With the help of this technique, agricultural production and productivity in many villages has increased manifold. Its uses include water for gardening, livestock, irrigation, domestic use with proper treatment and indoor heating for houses etc. The consequent rise in the income level of farmers has reduced the migration of farmers to urban areas and thus has promoted sustainable development in the state.

It may be mentioned that, the water harvesting structures are small scale and low cost structures which are constructed across a stream to slow or hold the flow of rainwater. They are made either of temporary materials such as brush, wire, poles, and loose rocks or of more permanent masonry materials. These water harvesting structures are used to store surface water for use, both during and after the monsoon. They also help in ground water recharge, which raises the water table in the area. Water harvesting structures are a highly effective practice to reduce flow velocities in channels and waterways. Water harvesting structures have a faster implementation timeline, are cost effective, and are smaller in scope.

Consequently, the Rural Development Foundation[2] (PHD RDF) of PHD Chamber of Commerce and Industry undertook rain water harvesting through construction of water harvesting structures to help the farmers and others in Rajasthan as it is a water deficient state. The project spanned the district of Sikar. In totality, the RDF has been able to construct around **170 water harvesting**

[2] PHD Rural Development Foundation (PHDRDF) was established in 1981 and registered under the Indian Trust Act. It is operating under the aegis of PHD Chamber of Commerce & Industry (PHDCCI).

structures in Alwar, Dausa and Sikar districts of Rajasthan and Mewat, Gurgaon in Haryana. A list of water harvesting structures constructed by PHD RDF is annexed as Annexure 12.

The PHD RDF constructed around **62 water harvesting structures with 11 structures having Lift Irrigation Systems in Sikar district of Rajasthan**. These water harvesting structures have had a significant impact on the lives of people of the district as there has been tremendous improvement in the standard of living of the people.

1.5.1 Significance of rain water harvesting in Sikar district

Water requirement in the district is very high owing to the agrarian nature of economy, poor rainfall and lack of perennial sources of water. Thus water conservation remains the only solution to all these problems. There is inadequacy of surface water in this area due to which rain harvesting has become inevitable. Rain water harvesting is the technique in which rain water is collected and stored at the surface or in sub-surface aquifers, before it is lost as surface run-off. In some of the villages, Lift Irrigation System[3] is used to supply water to farms.

The main techniques of rain harvesting are:

1. Storage of rain water on surface such as in tanks, ponds, Water harvesting structures , weirs etc,
2. Recharge to ground water such as pits, trenches, dug wells, hand pumps etc.

2. Objectives

The objective of the present study is to evaluate the change in the socio-economic status of the people of district after the construction of water harvesting structures by PHD RDF. The analysis would also assess the impact of water harvesting structures on the ground water recharge, area under irrigation and cultivation, income generation and livelihood of the people concerned.

The specific objectives of the study include:

1. To evaluate the change in socio-economic status of the people in the Sikar district before and after the construction of water harvesting structures.
2. To estimate the change in the level of total income before and after construction of water harvesting structures**.**
3. To compute the change in crop production before and after construction of structures.
4. To assess the change in area under irrigation and cultivation, before and after the construction of water harvesting structures
5. To assess the difference in agricultural productivity of villages using Lift Irrigation System and those which do not use Lift Irrigation System.

3. Research Methodology

The study is developed to test the hypothesis that Water harvesting structures facilitate irrigation and also facilitate availability of water for human consumption. Henceforth, the study has reviewed the impact of construction of these structures by PHD RDF on the socio economic structure of Sikar District.

[3] Lift irrigation System is a method of irrigation in which water is not transported by natural flow (as in gravity-fed canal systems) but is lifted with pumps or other means

3.1 Sample selection

The study has been conducted on the basis of survey of people from Sikar District. The sampling technique used in the study is Stratified Random Sampling as the samples chosen are the primary beneficiaries of Water harvesting structures i.e. the farmers. The village heads also helped in identifying the respondents. All of the respondents are primarily engaged in agriculture and allied activities within their respective villages.

The sample size is 270. The survey has responses from 11 villages namely Avinashi, Bhagwanpura, Chudla, Dass Ki Dhani(Dubra), Hatideh, Kishanpura, Loharabas, Lohiya Ki Dhani, Misrala Ki Dhani, Ramalayavas and Sawalpura. The respondents comprise village heads and villagers of the district.

It may be mentioned that the selected 270 samples of the water harvesting structures were a small sample size to be representative for the district. In order to make up for this limitation, this study involved extensive consultations with the builders of Water harvesting structures in the district and have largely drawn from their vast experiences. Since the designs were simple and based on local traditional wisdom of creating water bodies, local builders have constructed the water harvesting structures. In addition, two selective case studies were developed to substantiate some of the findings of the study. Amongst the total water harvesting structures surveyed in the Sikar district, the year of construction range from year 2004 to year 2012.

Exhibit 1.8: Number of respondents surveyed for 11 water harvesting structures

S.No.	Name of Village	Name of water harvesting structures	Number of respondents
1	Misrala ki Dhani	Camerewala	20
2	Sawalpura	Phutipal	20
3	Kishanpura	Hogdaya	21
4	Avinashi	Kaladeh	24
5	Chudla	Morkhub	24
6	Dass ki Dhani	Morghat	24
7	Hatideh	Atmaram	24
8	Lohiya ki Dhani	Bijlideh	24
9	Ramalayavas	Kalimaidi	24
10	Bhagwanpura	Nichladeh	25
11	Loharbas	Johadwala	26

The statistical tools used for the study are simple aggregates and averages which have been used to depict the status of cultivated and irrigated land, yield of crop production, income generation and other parameters before and after the construction of Water harvesting structures[4]. The data have been presented in graphs and charts for lucid illustration. Some qualitative analysis has also been incorporated in the study to support the opinions and relevant reactions of the respondents. This has helped in drawing a better idea of the impact of water harvesting structures on the socio economic status of village dwellers. A detailed statistical analysis has been given in Annexure 7.

[4] T-test has been used to validate the increase in income of the respondents, total cultivated area and total irrigated area.

Water Harvesting Structures Snapshot

Atmaram Water harvesting structure, Hatideh

Bijlideh, Lohiya ki Dhani

Hogdaya Water harvesting structure, Kishanpura

Kaladeh Water harvesting structure, Avinashi

Johadwala Water harvesting structure, Loharabas

Kalimaidi structure, Ramalayavas

Case studies

1. Bijlideh water harvesting structure

Bijlideh water harvesting structure constructed in Lohiya ki Dhani village of Sikar district in 2009 is 500m long, 150 feet wide and has a height of 8 feet. The structure irrigates an area of 431707.3 square meters and the water lasts in the reservoir for about 10 months.

Mali Devi, a female farmer of 45 years of age lives in Jahadwala ki dhani village. She draws water to irrigate her 200 bigha land.

"Water is now available throughout the year, before the water harvesting structures the hand pump would run out".

Before the structures crops would only grow in September, now the water harvesting structures irrigates all of her land and crops are grown throughout year. Mali Devi has been able to change cropping pattern as apart from Kharif crops, she can now grow wheat in Rabi season which was not possible before the construction of water harvesting structures. Earlier only mustard and bajra were grown but now wheat, jowar and vegetables are grown as well. This increase in crop production has increased the families' income and has allowed them to put a brick roof on the house and purchase some live stock. The number of people migrating in the family has halved and drinking water is now readily available throughout the year. Mali Devi has now been able to buy a tractor and pay off her monthly installments of the loan that she took for the same. She is water harvesting structures' success story.

2. Atmaram water harvesting structure

Mr. Vijay Singh, a farmer of age 65 lives in Hatideh village of Sikar district. He draws water for his fields from the Atmaram water harvesting structure. He believes that the water harvesting structures is beneficial as villagers now have easy access to water and they do not have to travel long distances for the same. Atmaram water harvesting structure constructed in Sawalpura village of Sikar district in 2010 is 1000m long, 100 feet wide and has a height of 10 feet. The water harvesting structur**e** irrigates an area of 907281.35 square meters and the water lasts in the reservoir for about 6 months.

The maximum holding capacity of the structure is 11098.89 sq m. The structure irrigates around 600-700 bigha of his land. According to him, about 20% of the water comes from alternate sources of water such as wells and tube wells. Construction of structures has had a positive impact on his socio economic status. After the construction of structures, he is now able to produce more crops than before. His annual household income has increased from Rs. 30000 in 2002 to Rs. 150000 in 2014 owing to the construction of water harvesting structures. Also the distance from which water has to be fetched has been reduced. Now, 40% of his time and effort are saved. Increase in productivity has also been accounted.

"We villagers are very satisfied with the administration of Water harvesting structures" said Mr. Vijay Singh.

As the increase in crops production has generated a greater income, the education of his children has improved as well. Before the water harvesting structure none of his children attended school but now they attend school regularly.

The construction of water harvesting structures has made a significant difference to groundwater recharge in the wells. There has been a positive impact on drinking water with the structure recharging ground water, dug wells and hand pumps now have a supply of water all year. Before the water harvesting structure was constructed, area under cultivation of crops was meagre at about 8-10 bigha which increased to 20-25 bigha.

"Income has increased and many people are now living in pucca houses rather than kachha houses", adds Mr. Vijay Singh.

Earlier he used to plant only bajra but the construction of water harvesting structure has enabled planting of more crops: wheat, cowpea and chana. He mentioned the need of LIS system in the village. In a nutshell the installation of Atmaram water harvesting structure has helped in uplifting the overall standard of Mr. Vijay Singh.

4. Data Analysis

The data collected through primary survey was analysed qualitatively as well as quantitatively to evaluate whether there has been an impact on the socio economic status of the people in Sikar district of Rajasthan. The survey was undertaken with an objective of knowing the benefits of not only the water harvesting structures but also of the Lift Irrigation System[5] constructed in 3 out of 11 villages surveyed and how it has facilitated agriculture growth and socio economic status of people of those villages compared to villages without the Lift Irrigation System.

It has been revealed that the water harvesting structures have helped in increase in average agriculture yield of crops which has facilitated the villagers with rising household incomes. Consequently, the socio economic status of people in the villages has improved considerably. The survey also revealed that the agriculture yield is higher in villages that have the Lift Irrigation System than those which do not have it.

The survey revealed that after the construction of water harvesting structures there has been an overall change in the socio- economic status of the villagers. There has been an increase in income, improvement in standard of living as people have now started living in pucca houses, an improvement in their eating habits, an increase in the livestock with people and an increase in crop productivity. Further, there has been a positive change in the social framework of the village as they have modernized and farmers have now become financially independent and sound.

Education facilities in the village have improved along with the irrigation & water resources. Children are able to attend schools more frequently. Villagers have now been able to pay off their debts and loans as their annual family income has shown an increasing trend. There has been immense employment generation and income from non-agricultural activities has also increased. The construction of Water harvesting structures has led to increase in agricultural productivity due to

[5] Lift irrigation is a method of irrigation in which water is not transported by natural flow but is lifted with pumps or other means.

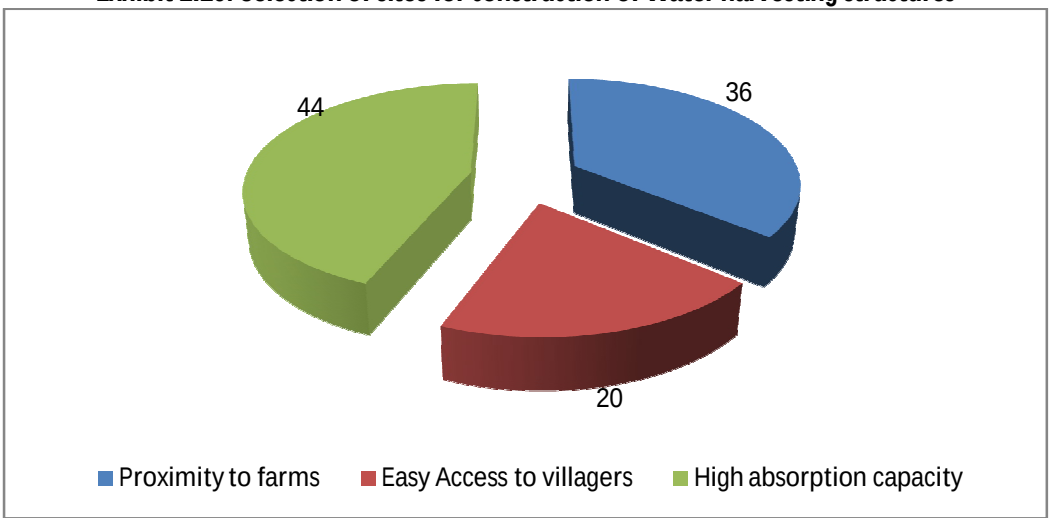
which the farmers do not have to leave their villages in search of work in the nearby urban areas; hence, the migration rate has gone down considerably.

4.1 Construction, Storage & Utilization of Water harvesting structures

4.1.1) Selection of sites for construction of Water harvesting structures

According to the field workers who constructed the water harvesting structures or are in charge of their repair and maintenance, location of water harvesting structures depends primarily on its usage. The survey revealed that around 44% of the Water harvesting structures sites were selected on the basis of high absorption capacity of the ground as unless the ground is impermeable, storage of water will not be feasible. 36% of the sites were selected on the basis of proximity to the farm and around 20% of the water harvesting structure sites were chosen on the basis of easy access to villagers. Thus, high absorption capacity of the ground appears to be the most important factor in the choice of selection of sites for construction of water harvesting structures.

Exhibit 1.10: Selection of sites for construction of Water harvesting structures

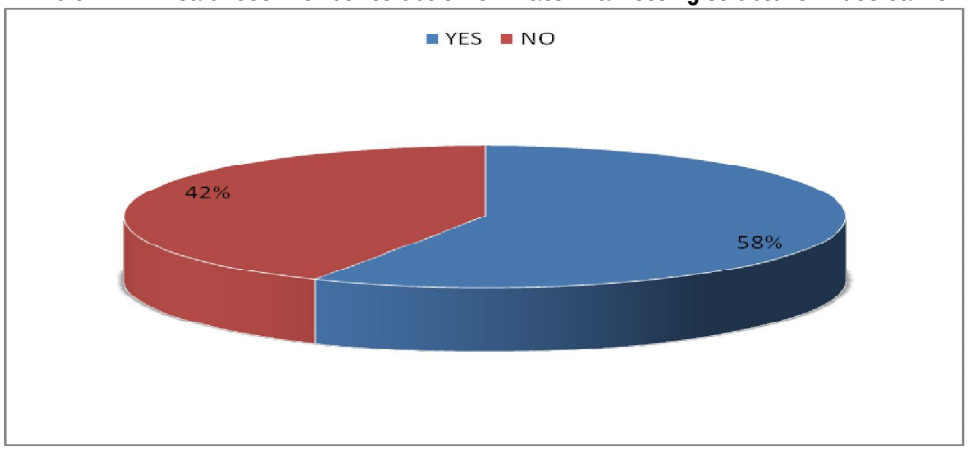


Source: Survey of Water harvesting structures in Sikar district of Rajasthan conducted by PHD Research Bureau, PHD Chamber of Commerce and Industry, 2015

4.1.2) Construction and capacity of Water harvesting structures

The village engineers and constructors of the Water harvesting structures along with the villagers of the Sikar district were surveyed to get a brief overview of the total capacity of the Water harvesting structures and their dimensions. According to them, earlier about 58% of the land was used for herding and grazing of animals and 42% of the land was left unused. With the construction of water harvesting structures, as high as 98% of the land is used fruitfully for the purposes of agriculture, herding and grazing of animals, among others.

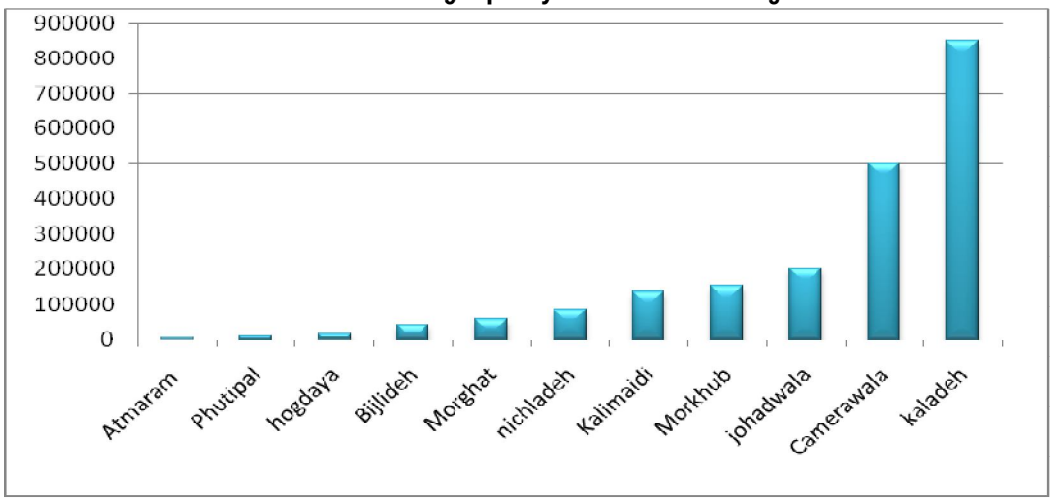
Exhibit 1.11: Area chosen for construction of Water Harvesting Structure in use earlier



Source: Survey of Water harvesting structures in Sikar district of Rajasthan conducted by PHD Research Bureau, PHD Chamber of Commerce and Industry, 2015

Depending on the size of the structures the total water holding capacity of Water harvesting structures surveyed ranges from 5549 cubic meters to 8,50,940 cubic meters; the average water-holding capacity of all the 11 water harvesting structures surveyed is recorded to be 1,86,295 cubic meters. Kaladeh water harvesting structures situated in Avinashi village has the maximum average water holding capacity of 8,50,940 cubic meters while the Atmaram water harvesting structures situated in Hatideh village has the least water holding capacity of 5,549 cubic meters.

Exhibit 1.12: Water holding capacity of Water harvesting structures

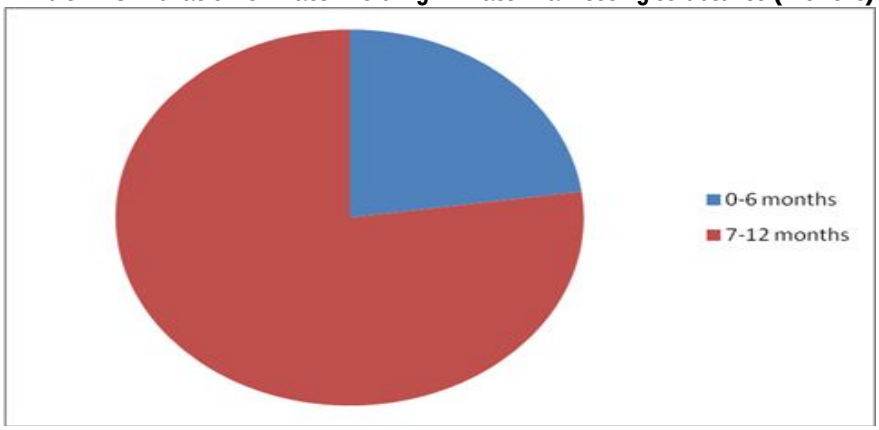


Source: Survey of Water harvesting structures in Sikar district of Rajasthan conducted by PHD Research Bureau, PHD Chamber of Commerce and Industry, 2015

4.1.3) Lasting of water in reservoirs (average time)

According to the villagers, the water lasts in different durations for periods ranging from 0-6 months to 7-12 months. Out of the 11 Water harvesting structures, 2 of these hold water for 6 months and 9 hold water for 7-12 months.

Exhibit 1.13: Duration of water holding in water harvesting structures (months)



Source: Survey of Water harvesting structures in Sikar district of Rajasthan conducted by PHD Research Bureau, PHD Chamber of Commerce and Industry, 2015

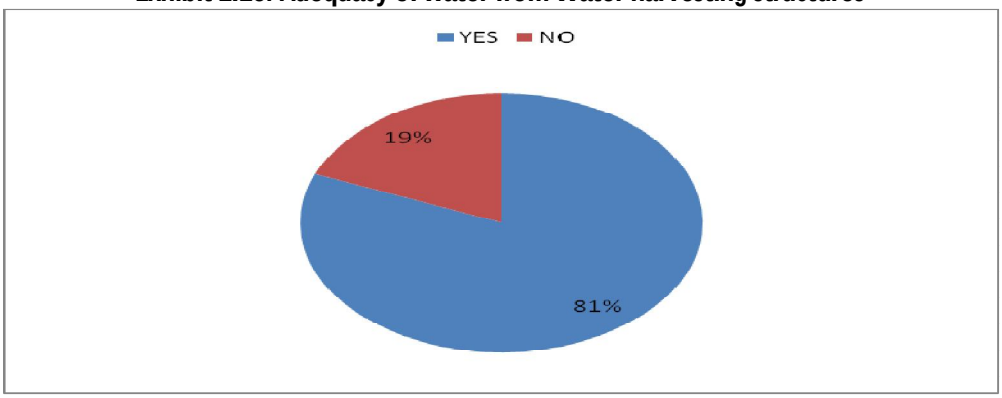
4.1.4) Utilization of water from Water harvesting structures

According to the survey, water from water harvesting structures is utilized by the villagers for various purposes such as farming, irrigating, drinking, bathing animals and household chores in their daily living.

4.1.5) Adequacy of water from Water harvesting structures

Around 80% of the respondents reported that water from Water harvesting structures is adequate and they did not have to search for alternative sources of water for the purpose of farming, drinking and their household chores.

Exhibit 1.16: Adequacy of water from Water harvesting structures



Source: Survey of Water harvesting structures in Sikar district of Rajasthan conducted by PHD Research Bureau, PHD Chamber of Commerce and Industry, 2015

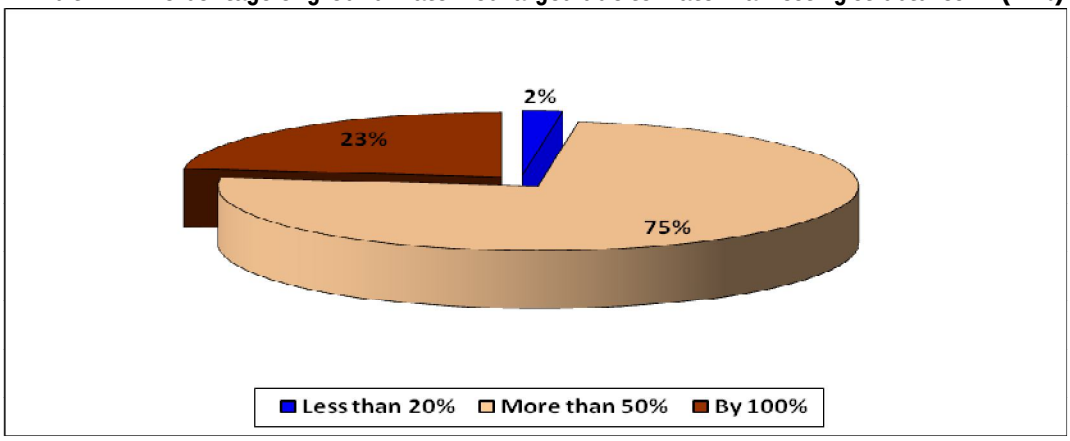
4.2) Impact of Water harvesting structures on socio-economic status of people

4.2.1) Recharge of ground water

On the basis of inputs provided by the respondents, water harvesting structures have facilitated the process of rainwater harvesting and thus increased the levels of groundwater recharge in the villages surveyed. Out of the 11 Water harvesting structures, 75% of the water harvesting structures have

contributed to ground water recharge by more than 50%, 23% of the water harvesting structures have contributed to the groundwater recharge by full 100% while 2% of the water harvesting structures have contributed to ground water recharge by less than 20%. Thus, water harvesting structures have significantly contributed to the increase in the groundwater recharge of wells.

Exhibit 1.17: Percentage of ground water recharged due to water harvesting structures (in %)



Source: *Survey of Water harvesting structures in Sikar district of Rajasthan conducted by PHD Research Bureau, PHD Chamber of Commerce and Industry, 2015*

In 2004[6], the ground water was around 200 ft (average) below for which the bore well had to be dug around 200 feet on an average to access ground water. However, after the construction of water harvesting structures, access to ground water has become easier near these structures. During the survey in 2014[7], it was revealed that ground water can be found at a level of 130 ft on an average near the water harvesting structures. Thus, the water harvesting structures have facilitated easy access to ground water which can now be used for various purposes such as farming, irrigating and drinking, among others.

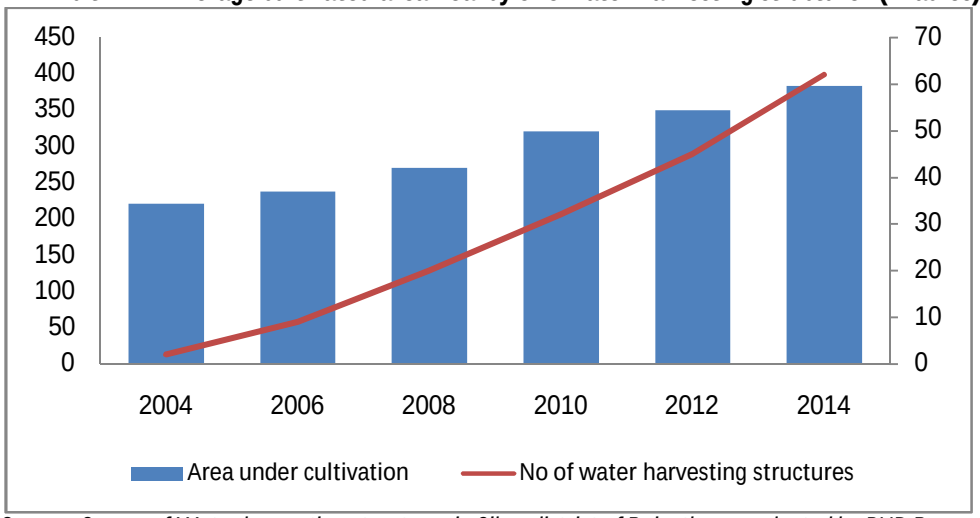
4.2.2) Area under cultivation

The water harvesting structures have facilitated agriculture in the villages, which is evident from the increase in area under cultivation. The average area under cultivation has increased from 221 acres per water harvesting structure in 2004 to 383 acres per water harvesting structure in 2014, posting an increase of around 73%.

[6] The base year has been taken as 2004 as only 1 water harvesting structure out of the 11 structures surveyed was constructed during the year. This year has been chosen for comparison with the year when the survey was conducted to gauge the socio-economic impact of these structures.

[7] Year 2014 has been taken to know the impact of construction of water harvesting structures as all the structures surveyed were constructed by this year and the survey was also conducted during this period.

Exhibit 1.17: Average cultivated area nearby one water harvesting structure (in acres)

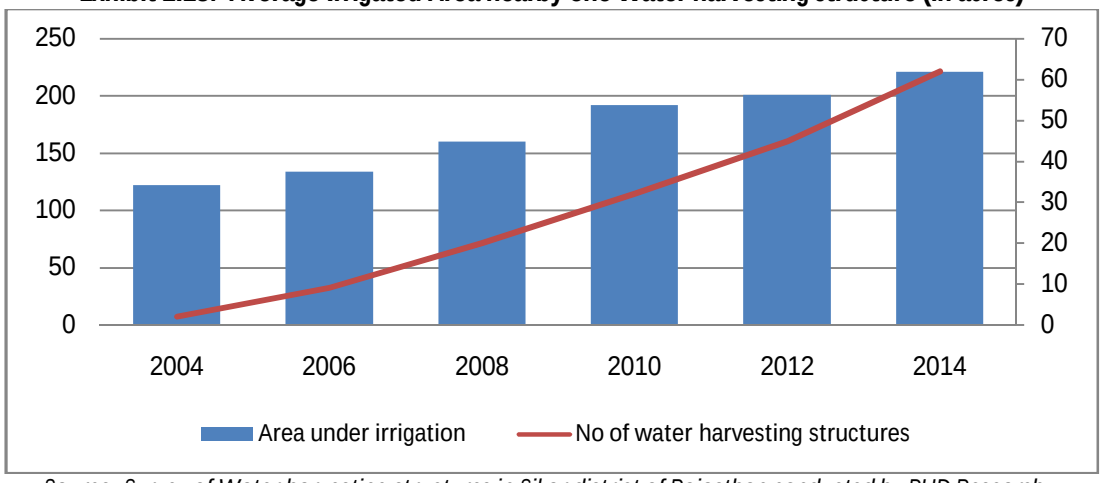


Source: *Survey of Water harvesting structures in Sikar district of Rajasthan conducted by PHD Research Bureau, PHD Chamber of Commerce and Industry, 2015*
Note: Right ordinate indicates number of water harvesting structures and left ordinate indicates area under cultivation

4.2.3) Area under irrigation

Area under irrigation has also registered a considerable increase due to the construction of water harvesting structures. Average area under irrigation has increased from 122 acres per water harvesting structure in 2004 to about 248 acres per water harvesting structure in 2014, registering an increase of around 103%.

Exhibit 1.18: Average Irrigated Area nearby one Water harvesting structure (in acres)



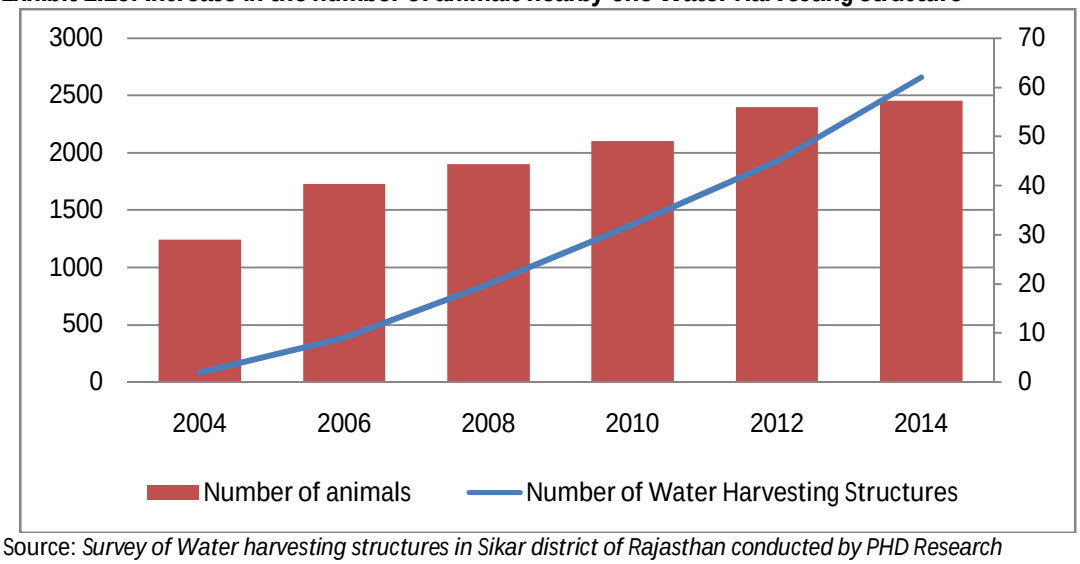
Source: *Survey of Water harvesting structures in Sikar district of Rajasthan conducted by PHD Research Bureau, PHD Chamber of Commerce and Industry, 2015*
Note: Right ordinate indicates number of water harvesting structures and left ordinate indicates area under irrigation

4.5.4) Change in number of animals

The numbers of animals has increased around the area of the water harvesting structures after their construction. The average number of animals around the water harvesting structures was about 1243 per village in 2004 which increased to 2452 per village in 2014.

It was found that animal rearing has now become an alternative source of livelihood for the people. The villagers said that with the increase in incomes following the construction of water harvesting structures, they were able to purchase animals such as cattle comprising of cow, buffaloes, as well as goats, sheeps and camels and develop animal rearing as an alternative occupation.

Exhibit 1.19: Increase in the number of animals nearby one Water Harvesting Structure



Source: *Survey of Water harvesting structures in Sikar district of Rajasthan conducted by PHD Research Bureau, PHD Chamber of Commerce and Industry, 2015*
Note: Left ordinate indicates number of animals and right ordinate indicates increase in number of water harvesting structures

4.2.5) Improvement in the yield of agricultural production

All farmers have stated that the production of all the major crops increased after the construction of water harvesting structures. The increase in average yield of crops is listed below:

Exhibit 1.20: Increase in Average Yield of Production of major crops (Kg/acre)

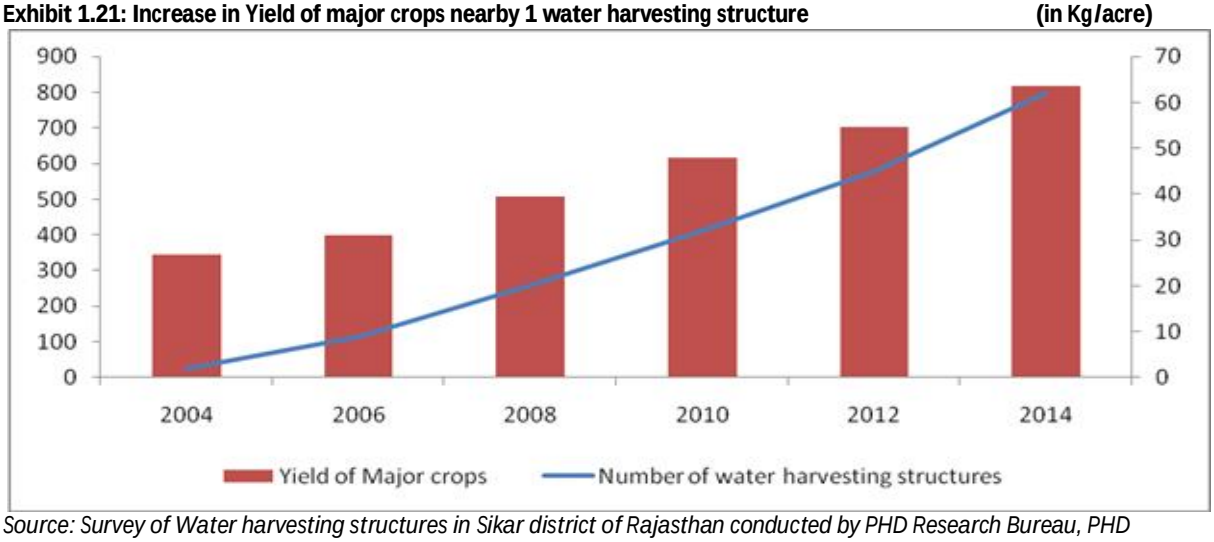
Major Crops	2004	2014	Percentage Increase (approx)
Bajra	270	590	119
Gram	150	580	287
Mustard	330	630	91
Wheat	632	1470	133
Average	**346**	**818**	**136**

Source: Survey of Water harvesting structures in Sikar district of Rajasthan conducted by PHD Research Bureau, PHD Chamber of Commerce and Industry, 2015
Note: The average yield of major crops is assessed to know the impact of construction of water harvesting structure during the 10 years period when the structures have been constructed. The average yield is calculated in kg/acre per Water Harvesting Structure in 11 villages surveyed

Average yield of wheat increased by around 133% while the average yield of bajra and mustard grew by more than 90%. Gram production has shown a remarkable growth of 287% from 2004 to 2014 when the water harvesting structures have been constructed.

There has been a substantial increase in average yield of major crops from 346 kg/acre per water harvesting structure in 2004 to around 818 kg/acre per water harvesting structure in 2014. Thus there has been a significant increase in yield of agriculture production in villages of Sikar district where the water harvesting structures have been constructed.

Exhibit 1.21: Increase in Yield of major crops nearby 1 water harvesting structure (in Kg/acre)



Source: Survey of Water harvesting structures in Sikar district of Rajasthan conducted by PHD Research Bureau, PHD Chamber of Commerce and Industry, 2015
Note: Left ordinate indicates yield of major crops in kg/acre and right ordinate indicates increase in number of water harvesting structures

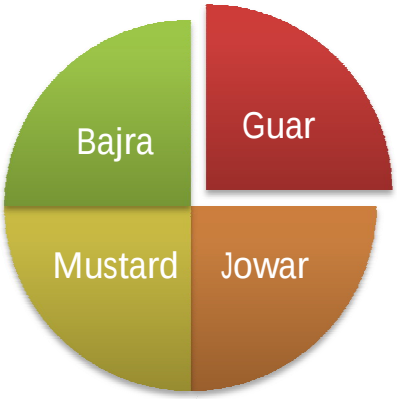
4.2.6) Change in crop pattern due to water harvesting structures

Respondents from all the villages are mostly farmers who have seen a change in their crop pattern in the recent times after the construction of water harvesting structures. There has been an increase in the number of crops planted after the construction of water harvesting structures. Farmers have experienced an increase in crop production as they are now able to sow many crops in comparison to one crop being grown earlier before the construction of water harvesting structures.

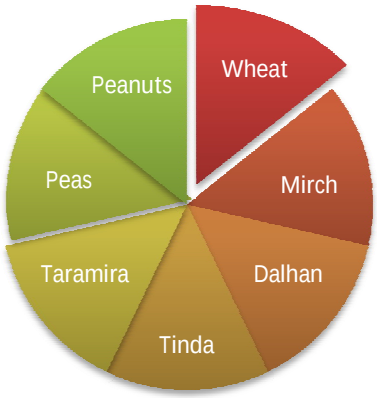
Before the advent of water harvesting structures, farmers used to grow mainly kharif crops and rain-fed crops. The major crops cultivated by the farmers were Bajra, Guar, Jowar and Mustard.

Farmers are now able to produce Wheat, Peanuts, Channa, Mirch, Dalhan, Peas, Tinda and Taramira apart from Mustard, Bajra, Guar and Jowar due to availability of water after the construction of Water harvesting structures.

Crop Production before the construction of Water Harvesting Structures



Crop Production after the construction of Water Harvesting Structures



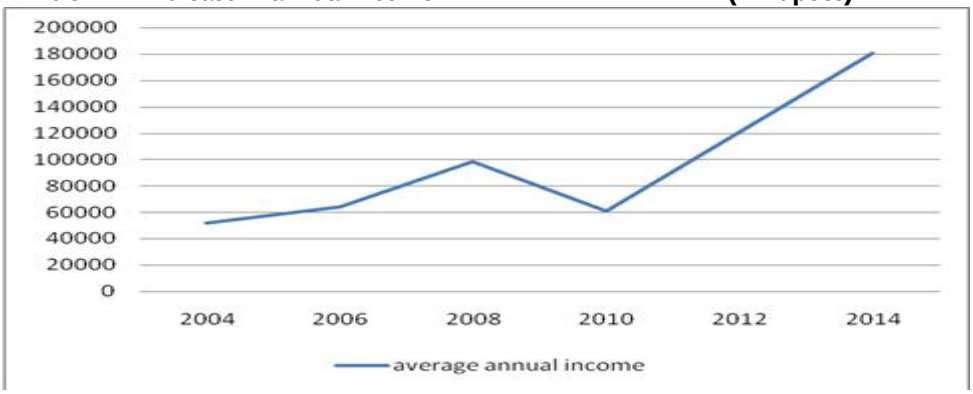
Source: Socio *Survey of Water harvesting structures in Sikar district of Rajasthan conducted by PHD Research Bureau, PHD Chamber of Commerce and Industry, 2015*
Note: The figure of crop production after the construction of water harvesting structures only mentions the new crops produced.

4.2.7) Increase in income due to construction of water harvesting structures

The survey revealed that the household income of the respondents increased by more than three-fold with the advent of water harvesting structures. Water harvesting structures boosted agriculture growth and facilitated allied and other non-agricultural activities due to which income of people increased more than proportionately. The average annual income of households surveyed in 11 villages was around Rs. 52,000 in 2004 which increased to around Rs. 1,81,000 in 2014.

There was a significant rise in income from 2004 to 2008 when the district witnessed widespread construction of the water harvesting structures. However, the villagers witnessed a slight decline in their household income as depicted in Exhibit 1.22 due to slowdown in the economy which had its repercussions in terms of fall in demand. Nonetheless, the demand for agriculture and allied products increased subsequently due to which there has been a sharp rise in household income from 2010 to 2014. A detailed statistical analysis also appears in Annexure 7.

Exhibit 1.22: Increase in annual income (in Rupees)



Source: Survey of Water harvesting structures in Sikar district of Rajasthan conducted by PHD Research Bureau, PHD Chamber of Commerce and Industry, 2015

4.2.8) Impact of Lift Irrigation System

According to the survey, the Lift Irrigation system has had a widespread impact on the cultivated area, irrigated area and agriculture yield of the villages where it is installed.

In the areas without the lift irrigation system, the cultivated area increased from 221 acres per water harvesting structure in 2014 to 336 acres per water harvesting structure in 2014 which is an increase of 52%. On the other hand, the villages with lift irrigation system witnessed an increase of 95% in the cultivated area which increased from 221 acres per water harvesting structure in 2004 to 430 acres per water harvesting structure in 2014.

The irrigated area in villages which do not have lift irrigation system, witnessed an increase of 77% as the area increased from 122 acres per water harvesting structure in 2004 to 216 acres in 2014. The villages with Lift Irrigation System witnessed a significant increase from 122 acre per water harvesting structure in 2004 to 280 acre per water harvesting structure in 2014 i.e. an increase of 130%.

Further, the yield of crops increased significantly from 346 kg/acre per water harvesting structure in 2004 to around 904 kg/acre per water harvesting structure in 2014 in villages where there is Lift Irrigation System. This is an increase of as much as 161% while the villages which do not have Lift Irrigation System witnessed an increase of 111% in yield of crops during the 10 years period.

Impact of Lift Irrigation System—Comparison on select parameters with villages that do not have Lift Irrigation System installed

S.No.	Parameters	2004	2014	%age Increase	2004	2014	%age Increase
		With Lift Irrigation System			*Without Lift Irrigation System*		
1	Increase in cultivated area (in acres per Water Harvesting Structure)[1]	221	430	95	221	336	52
2	Increase in irrigated area (in acres per Water Harvesting Structure)[2]	122	280	130	122	216	77
3	Increase in agriculture yield of major crops (kg/acre)[3]	346	904	161	346	732	111

Source: *Survey of Water harvesting structures in Sikar district of Rajasthan conducted by PHD Research Bureau, PHD Chamber of Commerce and Industry, 2015*

Note: ^Out of the 11 villages surveyed where each of water harvesting structure is constructed, 3 of these structures has the Lift Irrigation System installed

^^Out of the 11 villages surveyed where each of water harvesting structure is constructed, 8 of them did not have the Lift Irrigation System installed

[1]The total cultivated area is measured in acres per Water Harvesting Structure.

[2]The total irrigated area is calculated in acres per Water Harvesting Structure surveyed during the period June 2014-June 2015.

[3]The yield of major crops is assessed to know the impact of construction of water harvesting structure during the 10 years period when the structures have been constructed. The yield is calculated in kg/acre per Water Harvesting Structure surveyed

4.2.9) Improvement in child education

According to the survey, all the respondents reported that there has been an improvement in their socio-economic status. With the increase in income level of farmers during the last 10 years, the villagers are able to send their children to school due to which there has been an improvement in child education in the villages surveyed.

4.2.10) Impact on migration

According to the survey, the construction of water harvesting structures has influenced the migration process in the villages significantly. Earlier, the farmers were forced to leave their farms and villages and migrate to cities in search of work as they were not able to earn their livelihood from agriculture due to lower productivity. However, the construction of water harvesting structures has led to increase in agricultural productivity due to which income of the farmers have increased significantly. Therefore, they do not have to leave their villages in search of work in the nearby urban areas.

Impact at a glance

S.No.	Parameters	2004^	2014^^	%age Increase^^^
1	Increase in ground water recharge level (in ft)[1]	200	130	35
2	Increase in cultivated area (in acres per Water Harvesting Structure)[2]	221	383	73
3	Increase in irrigated area (in acres per Water Harvesting Structure)[3]	122	248	103
4	Increase in agriculture yield of major crops (kg/acre)[4]	346	818	136
5	Increase in number of animals[5]	1243	2452	97
6	Increase in annual income of households(in Rupees)[6]	52,567	1,75,136	233

Source: *Survey of Water harvesting structures in Sikar district of Rajasthan conducted by PHD Research Bureau, PHD Chamber of Commerce and Industry, 2015*

Note: [1]Increase in Ground Water recharge level has been calculated on the basis of digging a borewell. It was around 200 ft (average) in 2004 which with the development of Water Harvesting Structures has improved to the level of 130 ft (average) in Sikar District of Rajasthan.

[2]With the construction of water harvesting structures, the average cultivated area has increased as the fallow land which was not in use earlier, have now been used for agriculture activities due to construction of structures. Hence there has been an increase in cultivated area which is measured in acres per Water Harvesting Structure.

[3]The average irrigated area has also increased as water harvesting structures have facilitated irrigation to lands which were not under cultivation before. Hence the increase in average irrigated area is analysed to know the impact of construction of water harvesting structures. The average irrigated area is calculated in acres per Water Harvesting Structure in 11 villages surveyed during the period June 2014-June 2015.

[4]The average yield of major crops is assessed to know the impact of construction of water harvesting structure during the 10 years period when the structures have been constructed. The average yield is calculated in kg/acre per Water Harvesting Structure in 11 villages surveyed during the period June 2014-June 2015.

[5]These are average number of animals per village. The types of animals found in the villages surveyed are cattles comprising of cow, buffaloes, as well as goats, sheeps and camels.

[6]The increase in average annual incomes of households has been calculated on the basis of survey of 11 villages.

^2004 is taken as the base year when only one water harvesting structure was constructed

^^2014 is the recent year when the survey was conducted as is taken here to know the impact of water harvesting structure on socio-economic structure of Sikar District

^^^The percentage increase on each parameter is rounded off.

5. Conclusions

A significant portion of the economy of Rajasthan is agrarian. The agricultural sector of the state accounts for 28% share in the state's GSDP and around 80% of Rajasthan's population is dependent on agriculture for its livelihood. Being a desert area, the state's climate varies largely from arid to sub-humid.

As a part of its Corporate Social Responsibility initiatives (CSR), the PHD Chamber, under the aegis of its Rural Development Foundation (RDF), undertook rain water harvesting through construction of water harvesting structures to help the farmers and village dwellers in parts of Rajasthan as it is a water deficient state.

In the district of Sikar, the daily exploitation of underground water for irrigation and domestic use purposes is very high as compared to its recharge, which results in depletion of water table.

Also the amount of rainfall is very scanty and highly erratic, the expansion of irrigation provisions and efficient water management are major challenging tasks before the policy makers. Thus, the objective of the present study is to evaluate the change in the socio-economic status of the people of Sikar district after the construction of Water harvesting structures by PHD RDF.

The survey was done with an aim of knowing the benefits of not only the Water harvesting structures but also of the Lift Irrigation System constructed in 3 out of 11 villages surveyed and how it has facilitated agriculture growth and socio economic status of people of those villages compared to villages without the Lift Irrigation System.

The survey has revealed that the much needed construction of Water harvesting structures in the Sikar district of Rajasthan has led to widespread improvement in the socio-economic status of people. There has been an increase in income, improvement in standard of living; people have now started living in pucca houses. There has been an improvement in their eating habits, an increase in the number of livestock with people and an increase in crop productivity.

Further, there has been a positive change in the social framework of the village as they have modernized and farmers have now become financially independent and sound. The respondents have reported that the ground water level has increased by more than 50% and the cropping pattern has changed from that of rain- fed crops to all types of crops and vegetables.

The construction of water harvesting structures has led to significant increase in the income of the farmers. The income increase has helped farmers to increase their livestock, build pucca houses, pay off their loans and buy fertilizers, pesticides and tractors to facilitate their agricultural produce. The number of animals has increased by almost 97% (average) in the villages after the construction of water harvesting structures.

The water harvesting structures have facilitated the access to ground water near it. In 2004, the ground water was around 200 ft (average) below for which the bore well had to be dug around 200 feet on an average to access ground water. However, after the construction of water harvesting structures, access to ground water has become easier near these structures. During the survey in 2014, it was revealed that ground water can be found at a level of 130 ft on an average near the water harvesting structures.

The water harvesting structures have facilitated agriculture in the villages, which is evident from the increase in area under cultivation. The average area under cultivation has increased from 221 acres per water harvesting structure in 2004 to 383 acres per water harvesting structure in 2014, posting an increase of around 73%. The irrigated area on the other hand has increased from 122 acres per water harvesting structure in 2004 to about 248 acres per water harvesting structure in 2014, registering an increase of around 103%. Further, there has been a substantial increase in average yield of major crops from 346 kg/acre per water harvesting structure in 2004 to around 818 kg/acre per water harvesting structure in 2014.

With the availability of water facilities, the villagers do not have to travel to far off places to fetch water. This has helped villagers save their time and effort by about 53%. There has also been a positive impact on the migration in the villages as the farmers are able to earn a decent livelihood in their own villages and do not have to search for job in other villages or neighbouring urban areas.

Further, there has been an improvement in the standard of living. Child education in the villages has improved considerably during the last ten years. The women respondents have also opined that the construction of water harvesting structures have improved their status as they are able to work in their own farms or find employment in others' farms and are able to contribute to their family income.

During the survey, it was found that the villages where the Lift Irrigation System has been installed have witnessed higher agricultural productivity. The agricultural yield increased by 161% during the ten year period in villages with Lift irrigation system as compared to 111% increase in agriculture yield during the same period in villages which do not have Lift irrigation system.

Therefore, it is suggested that the Lift Irrigation System should be constructed in other villages also to increase the crop yield significantly. This will improve the socio-economic situation of villagers of the district in the coming times.

In a nutshell, the construction of water harvesting structures has had a significant impact on development of Sikar District of Rajasthan. Going ahead, the villagers look forward to further construction of water harvesting structures with Lift Irrigation Systems which will foster higher socio-economic growth of the district.

6. Suggestions

During the survey, the respondents made few suggestions with regard to development of water harvesting structures as well as overall development of the district. According to the respondents, there is a need for improvement in water sources in the villages for which larger number of water harvesting structures should be built and the height, depth and width of the existing ones should be increased.

The Lift irrigation system should be installed in all villages and should be further expanded in villages where they are already installed. The farmers living in the villages with Lift Irrigation System have suggested that there should be expansion in the lift irrigation system to boost productivity in the agriculture sector in their villages.

Spring irrigation, hand pumps and bore well should be provided in order to facilitate the irrigation facilities in the villages. Respondents have also suggested that there is a need for regular repair and maintenance of the existing structures and water sources. Further, pathways to these structures should be constructed and trees alongside the water harvesting structures should be planted. Prevention of walls of water harvesting structures from erosion should also be taken care of. To enhance agriculture productivity, crops must be made available at reasonable prices and High Yielding Variety (HYV) seeds should be made available.

The respondents have also suggested possible measures that could be undertaken in the village in order to make their lives better and simpler and to further improve their living standards.

Also, the health and education facilities in the villages need to be improved. Drainages and sewers need to be covered while clean drinking water tanks should be made available everywhere. Further, electricity should be provided and more schools and hospitals should be constructed and power stations should be built to ensure regular supply of electricity.

Female respondents have suggested that vocational and computer learning centres should be set up for women so as to enhance their skills. Employment opportunities should be generated for women so as to empower the woman economically and socially.

Also Community halls and meeting rooms should be constructed to facilitate social gatherings and public forums enhancing dissemination of knowledge.

The villagers appreciate the efforts of PHD RDF for constructing water harvesting structures that has uplifted their socio-economic status. Going ahead, they look forward to more such initiatives that would spur all-inclusive development of the district and of the state in the coming times.

Annexure 1
Details of Water harvesting structures surveyed

PHD Rural Development Foundation					
Water harvesting structures Locations for Impact Assessment					
S.No.	Name of Water harvesting structures	Village	District	State	Year of construction
1	**Phutipal**	Sawalpura	Sikar	Rajasthan	2004
2	**Hogdaya**	Kishanpura	Sikar	Rajasthan	2004
3	**Camera Wala**	Misrala Ki Dhani	Sikar	Rajasthan	2006
4	**Kaladeh**	Avinashi	Sikar	Rajasthan	2007
5	**Nichladeh**	Bhagwanpura	Sikar	Rajasthan	2008
6	**Kalimaidi**	Ramalayavas	Sikar	Rajasthan	2008
7	**Bijlideh**	Lohiya Ki Dhani	Sikar	Rajasthan	2009
8	**Johadwala**	Loharabas	Sikar	Rajasthan	2009
9	**Atmaram**	Hatideh	Sikar	Rajasthan	2010
10	**Morkhub**	Chudla	Sikar	Rajasthan	2010
11	**Morghat**	Dass Ki Dhani(Dubra)	Sikar	Rajasthan	2012

Annexure 2
Water harvesting structures that have LIS

PHD Rural Development Foundation					
Water harvesting structures Locations for Impact Assessment **Structures that have LIS**					
S.No	Water harvesting structures	Village	District	State	Year of construction
1	**Hogdaya**	Kishanpura	Sikar	Rajasthan	2004
2	**Camera Wala**	Misrala Ki Dhani	Sikar	Rajasthan	2006
3	**Morkhub**	Chudla	Sikar	Rajasthan	2010

Annexure 3

Dimensions of Water harvesting structures

Sr.no	Name of the Water harvesting structures	Length	Height	Breadth of reservoir	Maximum water holding capacity	Average water holding capacity
1	Kaladeh	2000 m	9 feet	1000 feet	1999980	850940
2	Camerawala	1500 m	15 feet	400 feet	999975	499987.5
3	Johadwala	2 km	12 feet	150 feet	400000	200000
4	Morkhub	600 m	24 feet	200 feet	319968	150870
5	Kalimaidi	1000 m	10 feet	500 feet	277505.5	135405
6	Nichladeh	1000 m	8 feet	200 feet	177315.6	85000
7	Morghat	500 m	8 feet	250 feet	111245.6	55625
8	Bijlideh	500 m	8 feet	150 feet	66750	40325
9	Hogdaya	1000 m	13 feet	200 feet	288903	14451
10	Phutipal	500 m	8 feet	50 feet	22171.1	11090
11	Atmaram	1000 m	10 feet	100 feet	11098.89	5549

Annexure 5

Sr.No	Name of the Water harvesting structures	Was the area chosen to be covered in use before	
		Yes	No
1	Nichladeh	100%	-
2	Johadwala	42.30%	57.70%
3	Hogdaya	76.20%	23.80%
4	Kaladeh	58.33%	41.67%
5	Bijlideh	37.50%	62.50%
6	Camerawala	45%	55%
7	Phutipal	70%	30%
8	Morkhub	58.30%	41.70%
9	Atmaram	50%	50%
10	Morghat	58.30%	41.70%
11	Kalimaidi	37.50%	62.50%

Annexure 6

S.No.	Name of the Water harvesting structures	How long does the water last in the reservoir	Was the area chosen to be covered in use before	
			Yes	No
1	Morkhub	12 months	58.30%	41.70%
2	Camerawala	12 months	45%	55%
3	Kaladeh	11 months	58.33%	41.67%
4	Bijlideh	10 months	37.50%	62.50%
5	Hogdaya	9 months	76.20%	23.80%
6	Morghat	9 months	58.30%	41.70%
7	Kalimaidi	7 months	37.50%	62.50%
8	Phutipal	6 months	70%	30%
9	Atmaram	6 months	50%	50%
10	Nichladeh	9-10 months	100%	-
11	Johadwala	9-10 months	42.30%	57.70%

Annexure 7

Statistical Analysis

The objective of the present study is to evaluate the change in the socio economic status of the people of Sikar district after the construction of Water harvesting structures by PHDRDF. Several parameters have been chosen, viz. area under irrigation, and cultivation, yield per acre, annual income of the villagers, level of education, standard of living etc. Some of these are quantitative, while others are qualitative only (i.e. not easily quantifiable). The general impression is that there has been an overall improvement. This hypothesis is being tested using statistical methods.

Three economic parameters have been chosen viz,

X_1= total irrigated area
X_2= average annual income per household
X_3=total cultivated area

The data pertain to the particular village where a water harvesting structure has been constructed. As the number of water harvesting structures constructed is 11, sample size n=11.

Further,
X_{i1}= value of parameter X_i , 2004
X_{i2}= value of the parameter , 2014
(i=1,2,3)

Data collected are tabulated as under:-

S. no	Name of Water harvesting structures	Total irrigated area(in bigas)				
		X_{11j}	X_{12j}	D_{1j}	d_{1j}	d_{1j}^2
1	Phutipal dam	239	507	268	-48.90909091	2392.099174
2	Atmaram dam	385	855	470	153.0909091	23436.82645
3	Morkhub dam	138	316	178	-138.9090909	19295.73554
4	Bijlideh dam	195	332	137	-179.9090909	32367.28099
5	Hogdaya dam	415	820	405	88.09090909	7760.008264
6	Kaladeh dam	550	1010	460	143.0909091	20475.00826
7	Nichladeh dam	297	762	465	148.0909091	21930.91736
8	Johadwala dam	285	548	263	-53.90909091	2906.190083
9	Morghat dam	340	645	305	-11.90909091	141.8264463
10	Kalimaidi dam	415	851	436	119.0909091	14182.64463
11	Camerawala	89	188	99	-217.9090909	47484.3719

X_{11j}(mean)=Summation (X_{11j})/n
X_{12j}(mean)=Summation (X_{12j})/n
D_{1j}= X_{12j}- X_{11j}
d_{1j}= D_{1j}- mean (D_{1j})
s_1^2=Summation (d_{1j}^2)/10; (n-1=10)
t_1= (X_{12j}(mean)- X_{11j}(mean))/s_1= 2.28

t_1 follows Student's t-distribution with 10 degree of freedom. From tables, the level of significance, i.e. the critical point is 0.023, i.e., with 99.977% probability, it can be stated that there was an increase in total irrigated area.

Similarly for X_2= average annual income

S. no	Name of Water harvesting structures	Average annual income of the respondents				
		X_{21j}	X_{22j}	D_{2j}	d_{2j}	d_{2j}^2
1	Phutipal dam	65000	187250	122250	-6583.9	43347739.21
2	Atmaram dam	50000	136875	86875	-41958.9	1760549289
3	Morkhub dam	55000	228750	173750	44916.1	2017456039
4	Bijlideh dam	35833	111250	75416.6	-53417.3	2853407939
5	Hogdaya dam	40000	155714	115714	-13119.9	172131776
6	Kaladeh dam	33375	189375	156000	27166.1	737996989.2
7	Nichladeh dam	65000	164800	99800	-29033.9	842967349.2
8	Johadwala dam	53077	206346	153269	24435.1	597074112
9	Morghat dam	60000	179375	119375	-9458.9	89470789.21
10	Kalimaidi dam	41250	137083.3	95833.3	-33000.6	1089039600
11	Camerawala	70000	288890	218890	90056.1	8110101147

X_{21j}(mean)=Summation (X_{21j})/n

X_{22j}(mean)=Summation (X_{22j})/n
D_{2j}= X_{22j}- X_{21j}
d_{2j}= D_{2j}- mean (D_{2j})
s_2^2=Summation (d_{2j}^2)/10
t_2= (X_{22}(mean)- X_{21}(mean))/s_2= 3.01

t_2 is significant at 0.007 level i.e., with probablity 99.993% it can be stated that there has been an increase in annual average income.

Similarly for X_3= Total cultivated area

S. no	Name of Water harvesting structures	Total cultivated Area(in bigas)				
		X_{31j}	X_{32j}	D_{3j}	d_{3j}	d_{3j}^2
1	Phutipal dam	503	740	237	-166.727	27797.98
2	Atmaram dam	664	1016	352	-51.7273	2675.711
3	Morkhub dam	502	772	270	-133.727	17882.98
4	Bijlideh dam	290	559	269	-134.727	18151.44
5	Hogdaya dam	450	875	425	21.27273	452.5289
6	Kaladeh dam	605	1175	570	166.2727	27646.62
7	Nichladeh dam	464	1227	763	359.2727	129076.9
8	Johadwala dam	626	1505	879	475.2727	225884.2
9	Morghat dam	700	905	205	-198.727	39492.53
10	Kalimaidi dam	923	1090	167	-236.727	56039.8
11	Camerawala check	357	661	304	-99.7273	9945.529

X_{31j}(mean)=Summation (X_{31j})/n
X_{32j}(mean)=Summation (X_{32j})/n
D_3= X_{32j}- X_{31j}
d_{3j}= D_{3j}- mean (D_{3j})
s_3^2=Summation (d_{3j}^2)/10
t_3= (X_{32}(mean)- X_{31}(mean))/s_3= 1.71

t_3 is significant at 0.045 level of significance, i.e. with probability 99.055%, it can be stated that there has been an increase in area cultivated.

Annexure 8

S.No.	Name of the Water harvesting structures	Was there need of Water harvesting structures in area chosen		Is there lift irrigation system in your village?	
		Yes	No	Yes	No
1	Phutipal	55%	45%		No
2	Atmaram	69.60%	30.40%		No
3	Morkhub	58.30%	41.70%	Yes	
4	Bijlideh	41.60%	48.40%		No
5	Hogdaya	57.15%	42.85%	Yes	
6	Kaladeh	70.83%	29.17%		No
7	Nichladeh		100%		No
8	Johadwala	62.50%	37.50%		No
9	Morghat	91.60%	8.40%		No
10	Kalimaidi	75%	25%		No
11	Camerawala	30%	70%	Yes	

Annexure 9

Sr.No	Name of the Water harvesting structures	Average Cultivated area(bigha)		Average Irrigated area(bigha)	
		2004	2014	2004	2014
1	Nichladeh	503	740	239	507
2	Morkhub	664	1016	385	855
3	Atmaram	502	772	138	316
4	Camerawala	290	559	195	332
5	Kalimaidi	450	875	415	820
6	Phutipal	605	1175	550	1010
7	Hogdaya	464	1227	297	762
8	Johadwala	626	1505	285	548
9	Morghat	700	905	340	645
10	Kaladeh	923	1090	415	851
11	Bijlideh	357	661	89	188

Annexure 10

S. no	Name of Water harvesting structures	Average composition of animals		
		2004	2014	%age change
1	Phutipal	975	1970	102%
2	Atmaram	905	1817	101%
3	Morkhub	1479	3392	129%
4	Bijlideh	484	640	32%
5	Hogdaya	943	1735	84%
6	Kaladeh	1846	3396	84%
7	Nichladeh	796	2544	220%
8	Johadwala	971	1913	97%
9	Morghat	1700	3026	78%
10	Kalimaidi	1894	3150	66%
11	Camerawala	1485	2865	93%

Annexure 11

PHD Rural Development Foundation		
	List of LIS	
Sr. No	Name of Water harvesting structures	No of LIS
1	Kewra wala	4
2	Mogdya wala	3
3	Morkhu wala	3
4	Biya wala	1
5	Johar wala	1
6	Nichala Deh	1
7	Bhoomiya wala	2
8	Shiv Nagri	2
9	Teeba wala	2
10	Jhakri Deh	2
11	Baneth wala	1
	Total	**22**

Annexure 12

PHD RURAL DEVELOPMENT FOUNDATION			
List of All Water harvesting structures			
S.No	**Name of Projects /Water harvesting structures**	**Location (name of village)**	**Distt & State**
1	Ram Ganga Sagar	Lava ka Vaas, Thanagazi	Alwar,Rajasthan
2	Roop Leela Sagar	Karaoli	Alwar,Rajasthan
3	Palriwala Sarovar IV	Math Ki Dhani, Neem ka Thana	Sikar,Rajasthan
4	Muhalla Mandawara	Baleta	Alwar,Rajasthan
5	Baba Ramdas ka Johad	Khunteta Ramgarh,	Alwar,Rajasthan
6	Banswali	Gudha kalyanpura	Alwar,Rajasthan
7	Sarvajanik	Bhurana, bhima pahadi	Alwar,Rajasthan
8	Meeyajiwala	Bhatkool, Tijara	Alwar,Rajasthan
9	School wali Talai	Kulsada	Alwar,Rajasthan
10	Sarvajanik	Macha,	Alwar,Rajasthan
11	Sucool gahti ko	Devta, Kishengarh	Alwar,Rajasthan
12	Panchveer wala	Jharkhera	Alwar,Rajasthan
13	Kati Ghreesni ka	Odra, Kishengarh	Alwar,Rajasthan
14	Murghutt wala	Sariyakavaas, Augyara	Alwar,Rajasthan
15	Phuta Bandh	Lava ka Vaas,	Alwar,Rajasthan
16	Maniram ka Anicut	Mootuka,	Alwar,Rajasthan
17	Pariwala ka	Nayagaon Khera	Alwar,Rajasthan
18	Paparawala	Lava ka Vaas,	Alwar,Rajasthan
19	Phuta Bandh	Bhagdolee	Alwar,Rajasthan
20	Parikawala	Dwarapura	Alwar,Rajasthan
21	Sumarewali	Kraska	Alwar,Rajasthan
22	Bhakundawala	Todalee	Alwar,Rajasthan
23	Fotkawala	Karaoli	Alwar,Rajasthan
24	Sarvajanik	Sriya ka vaas	Alwar,Rajasthan
25	Sucool gahti ka	Dawana	Alwar,Rajasthan
26	Burja wala	Khirat ka Baas, Rajgarh	Alwar,Rajasthan
27	Amar Singh ka Anicut	Mahuaa	Alwar,Rajasthan
28	Muhalla Mandawara	Baleta	Alwar,Rajasthan
29	Ghatiwala	Mancha	Alwar,Rajasthan
30	Kareria ka Bandh	Kareria	Alwar,Rajasthan
31	Harsagar	Sarangpur	Alwar,Rajasthan
32	Gufawala Johad	Macha, Kishengarh	Alwar,Rajasthan
33	Palriwala Sarovar-I	Guwara Soti,Thanagaz	Alwar,Rajasthan
34	Palriwala Sarovar-II	Guwara Byas, Thanagaz	Alwar,Rajasthan
35	Fatya Khora wala Bandh	Naya Bass	Alwar,Rajasthan
36	Fali wala Bandh	Nirbha Lesawa	Alwar,Rajasthan
37	Hogadya wala	Kishanpura	Sikar,Rajasthan

38	Chhatri wala	Kishanpura	Sikar,Rajasthan
39	Hadidehwala	Math ki Dhani	Sikar,Rajasthan
40	Phutipaal wala	Savalpura Tavran	Sikar,Rajasthan
41	Bijlidehwala	Mishrala Ki Dhani, Lohiya	Sikar,Rajasthan
42	Saidala Wala	Saidala	Sikar,Rajasthan
43	Jhakadi Deh Wala	Hathideh	Sikar,Rajasthan
44	Nichla Deh Wala	Bhagwan Pura	Sikar,Rajasthan
45	Chhandan wala	Loharabaas	Sikar,Rajasthan
46	Lodhala wala	Tejalagaon	Sikar,Rajasthan
47	Chatara wala Bandh	Jamadolli Guara	Alwar, Rajasthan
48	Ghata wala Bandh	Ghata Shamsbad Ferozpur Jhirka	Mewat,Haryana
49	PHD House	August Kranti Marg, New Delhi	NCT Delhi
50	Ghata Maujee ka Johad	Gondi Mahuaa,	Alwar, Rajasthan
51	Jhumaly ka Johad	Langarepura	Alwar, Rajasthan
52	Ranan wala	Ranon ki Dhani	Alwar, Rajasthan
53	Bhairu Ka Rada Wala	Ramji Soti	Alwar, Rajasthan
54	Papda Wala	Kolesar	Alwar, Rajasthan
55	Kali Bhat Wala	Khohdariba	Alwar, Rajasthan
56	Dholpapda Wala	Lala Bhaiya Dabar	Alwar, Rajasthan
57	Gadha Khol Wala	Jamdoli	Alwar, Rajasthan
58	Phutya wala	Jamdoli	Alwar, Rajasthan
59	Bodya Wala	Radi Nadu, Rajgarh	Alwar, Rajasthan
60	Chokhandya Wala	Nangaldasa	Alwar, Rajasthan
61	Musandya Wala	Malion Ki Dhani	Alwar, Rajasthan
62	Golyala ka Mod Wala	Narayanpur	Alwar, Rajasthan
63	Baba Water harvesting structuresodardas Wala	Bighota, Rajgarh	Alwar, Rajasthan
64	Ram Swarup Ki Ghati Wala	Rada, Rajgarh	Alwar, Rajasthan
65	Pahaad Wala	UprelaGuwara, Bighota	Alwar, Rajasthan
66	Dher Wala	Tilwad	Alwar, Rajasthan
67	Aleva-I	Bhuleri Rajgarh	Alwar, Rajasthan
68	Aleva-II	Rajgarh Dhani	Alwar, Rajasthan
69	KholiWala	Sirmoli	Alwar, Rajasthan
70	Kalimaidi Wala	Ramlayas, Ban Ki Dhani	Sikar,Rajasthan
71	Gadiwaar Wala	Kalakota	Sikar,Rajasthan
72	Mauda Wala	Luharawas	Sikar,Rajasthan
73	Saaran Wala	Dubra,Nimkathana	Sikar,Rajasthan
74	Bou Ka Nala,	Losal Brahmaan	Alwar, Rajasthan
75	Burja wala,	Todi ka baas	Alwar, Rajasthan
76	Baneth wala	Chota Kolesar	Alwar, Rajasthan
77	Gol Rada Wala Bandh	Nirbha	Alwar, Rajasthan
78	Samla khora	Gugali,Rajgarh	Alwar, Rajasthan
79	Rithwala Bandh	Rada	Alwar, Rajasthan

80	Dhonk Wala Bandh	Gugali, Thanagazi	Alwar, Rajasthan
81	Mansa Mata wala	Papadi, Viratnagar	Alwar, Rajasthan
82	Kuchyawala	Shyaluta	Alwar, Rajasthan
83	Joharwala	Luharabaas	Sikar,Rajasthan
84	Oonda Nala wala Bandh	Ram Nagar	Dausa, Rajasthan
85	Dhandh wala	Kishanpur Dhani	Sikar,Rajasthan
86	Jheel ki Radi Wala	Malki, Rajgarh	Alwar, Rajasthan
87	Kharada wala	Panch Nayala	Sikar,Rajasthan
88	Buji Wala	Luharawas	Sikar,Rajasthan
89	Shivnagari wala	Shiv Nagari	Alwar, Rajasthan
90	Girati Wala	Luharawas	Sikar,Rajasthan
91	Tapkeshwar Wala	Jharinda Jatala, Angari ki dhani	Sikar,Rajasthan
92	Kaladeh wala	Avinashi	Sikar,Rajasthan
93	Buja Wala	Luharawas	Sikar,Rajasthan
94	Nai Wala	Luharawas	Sikar,Rajasthan
95	Dhiyawala	Giaadali Ki Dhani	Sikar,Rajasthan
96	Nayakuanwala	Panth ki Dhani	Sikar,Rajasthan
97	Neemdiwala	Gurjaron Ki Dhani, Luharabaas, Block-Neem Ka Thana	Sikar,Rajasthan
98	Kemra Wala	Mishrala Ki Dhani, Lohiya	Sikar,Rajasthan
99	Nari deh Wala	Swami Ki Dhani	Sikar,Rajasthan
100	Sarpanchwala	Banjaron ki Dhani	Alwar, Rajasthan
101	Bhomiyawala	Bandipul	Alwar, Rajasthan
102	Morkhub wala	Chudhla village	Sikar,Rajasthan
103	Guanawala	Baldevgarh	Alwar, Rajasthan
104	Atmaram	Hathideh	Sikar,Rajasthan
105	Teenchwala	Rupbass	Alwar, Rajasthan
106	Narayanimata Wala	Baldevgarh	Alwar, Rajasthan
107	Kaachwala	Gujoro Ki Dhani, Sayaluta	Alwar, Rajasthan
108	Rishi Parasar Dham wala	Meeno Ki Dhani, Khohdariba	Alwar, Rajasthan
109	Battawala	Shyaluta	Alwar, Rajasthan
110	Hathi Paprawala	Prempura	Alwar, Rajasthan
111	Birwali	Prem pura	Sikar,Rajasthan
112	Bamrodi ka nala wala	Sawar Devi ki dhani, Kishanpur	Sikar,Rajasthan
113	Lakhodiwala	Nai Dhani, Kala Kheda	Sikar,Rajasthan
114	Retalawala	Luharbaas	Sikar,Rajasthan
115	Dankavwala	Meeno ki Dhani, Kishan pura	Sikar,Rajasthan
116	Khorawala	Kishan Pura, Neem Ka Thana	Sikar,Rajasthan
117	Radiwala	Losal, Rajgarh	Alwar, Rajasthan
118	Bagriya bhata wala	Losal, , Rajgarh	Alwar, Rajasthan
119	Naharwala	Kankar ka Tivara,	Sikar,Rajasthan

		Mukkalbaas	
120	Bairlawala	Chudla, Neem Ka Thana	Sikar,Rajasthan
121	Badi Khola Wala	Chehlka village	Mewat,Haryana
122	Chobdyawala	Toda, Neem Ka Thana	Alwar, Rajasthan
123	Nalhad wala	Nalhar	Mewat,Haryana
124	Tapkanwala	Tapkan, Rehna, Nuh	Mewat,Haryana
125	Teebawala	Shiv Nagari ,Rajgarh	Alwar, Rajasthan
126	Mundya wala	Mundya Ki Dhani, Chudla	Sikar,Rajasthan
127	Pipliwala	Gurkakheda, Rajgarh	Alwar, Rajasthan
128	Kalidanser	Devipura	Sikar,Rajasthan
129	Chinhatawala	Niharika, Firozpur Zhirka,	Mewat,Haryana
130	Behraliwala	Basaimeo	Mewat,Haryana
131	Nayakuanwala	Das Ki Dhani	Sikar,Rajasthan
132	Jogiwala	Mohwalbas,Neem KaThana	Sikar,Rajasthan
133	Bhojkalawala	Kotla, Rajgarh	Alwar, Rajasthan
134	Pol wala	Polwala ,Firozpurjhirka	Mewat,Haryana
135	Johari wala	Basaimeo	Mewat,Haryana
136	Badabeer mandir Wala	Manwaki,Pataudi	Gurgaon,Haryana
137	Morghata Wala	Dubra,Neem ka Thana	Sikar,Rajasthan
138	Badanala Wala	Kutuki,Rajgarh	Alwar, Rajasthan
139	Kalakhana Wala	Nangaldasa,Rajgarh	Alwar, Rajasthan
140	Jain Biswabharti	Ladnun	Nagaur,Rajasthan
141	Bankhla Wala	Loharabas Dhani	Sikar,Rajasthan
142	Bera Wala	Loharabas	Sikar,Rajasthan
143	Nanda Wala	Gujro ki dhani	Sikar,Rajasthan
144	Soti wala	Ghata Ferozpur Jhirka	Mewat,Haryana
145	Rangalarajpur wala	Rangala Rajpur	Mewat,Haryana
146	Mudling Wala	Basai Meo	Mewat,Haryana
147	Joshi wala	Kalakota Nimkathana	Sikar,Rajasthan
148	Bedha wala	Pawata ,Rajgarh	Alwar, Rajasthan
149	Bandai wala	Balaiokid Danai	Sikar,Rajasthan
150	Loni wala	Jogion ki Dhani	Sikar,Rajasthan
151	Kaladeh wala	Loni wala village	Sikar,Rajasthan
152	Moutala wala	Lamba Beena ki Dhani	Sikar,Rajasthan
153	Khatli wala	Dhima wali Dhani	Sikar,Rajasthan
154	Tilwala	Parsa ki Dhani	Sikar,Rajasthan
156	Lal kuan Joshi wala	Guara Byas, Thanagazi	Alwar, Rajasthan
157	Ghatda wala	Dana ka Guara, Rajgarh	Alwar, Rajasthan
158	Jugal pura wala	Jugal pura, Neem ka thana	Sikar,Rajasthan
159	Devipura wala	Devipura, Sri madhopur	Sikar, Rajasthan
160	Hanumanji wala	Bal devgarh,Rajgarh	Alwar, Rajasthan
161	Beena wala		Alwar, Rajasthan
162	Panda wala	Khah Dauba , Rajgarh	Alwar, Rajasthan
163	Nariyala wala	Guwada Har, Thana Gaji	Alwar, Rajasthan

164	Baba Chand Chak Nath wala	Nurgarh, Pataudi	Gurgaon, Haryana
165	Puthiyala wala	Nathoki Dhani	Sikar,Rajasthan
166	Dola Bhatta	Kala kota	Sikar,Rajasthan
167	Baba wala	Kala kota	Sikar,Rajasthan
168	Saidala wala	Saidala	Sikar,Rajasthan
169	Tatla wala	G.D.K	Sikar,Rajasthan
170	Mandir wala	Kala kota (Ashram)	Sikar,Rajasthan

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Ms. Huma Saif Qazi, Research Associate, PHD Chamber of Commerce and Industry, has nearly one year of experience. As a part of the PHD Research Bureau, she is handling the State Affairs desk and she has been productive for preparing analytical report on the various aspects of the Indian economy and conducting survey-based studies. She is a Masters in Economics from Jamia Millia Islamia University, Delhi.

PHD Research Bureau

PHD Research Bureau; the research arm of the PHD Chamber of Commerce and Industry was constituted in 2010 with the objective to review the economic situation and policy developments at sub-national, national and international levels and comment on them in order to update the members from time to time, to present suitable memoranda to the government as and when required, to prepare State Profiles and to conduct thematic research studies on various socio-economic and business developments.

The Research Bureau has been instrumental in forecasting various lead economic indicators national and sub-national. Many of its research reports have been widely covered by media and leading newspapers.

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PHDRDF Jal Sanchayan aims at improving the livelihood of the rural community through water harvesting systems, recharging aquifers and creating self reliance and community ownership. The program also aims at reviving traditional water resources through watershed technology and practice to restore ecological balance. So far more than 170 water harvesting structures have been constructed which has shown tremendous impact at the local economy and helped in the regeneration of forest and enhanced wild life in more than 400 villages of Rajasthan and Haryana.