CHAPTER - III

WATER HARVESTING IN THE REGION

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SUMMARY

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3.1 INTRODUCTION

In the previous chapter, an attempt has been made to review the physiography, drainage, soils, climate, land use pattern and demographic structure etc. as a basis for rainwater harvesting. The present chapter aims to review the concept, the traditional practices of rainwater harvesting & to study the present status of rainwater harvesting practices in the study region.

3.2 CONCEPT OF WATER HARVESTING

3.2.1 DEFENATION AND SCOPE OF WATER HARVESTING

Water is a mobile substance, which exists in three phases of solid (ice), liquid and vapur. It is always on the move and water harvesting is the practice of holding it in place or in the desired phase for some period for human utilization.

According to Geddes (1963), water harvesting means, "the collection and storage of any form of water, either runoff or creek flow for irrigation use." Currier (1973) has defined water harvesting as "the process of collecting natural precipitation from prepared water sheds for beneficial use."

In the Handbook on water Harvesting, Frazier and Myers (1983) have defined the term "water harvesting" as the process of collecting and storing water from an area that have been treated to increase precipitation runoff. A "Water harvesting system" has described as the complete facility for collecting and storing precipitation runoff. It is composed of a catchments or water collecting area, a water storage structure and various other components such as piping, evaporation control and fencing.

In scientific terms, water harvesting refers to collection and storage of rainwater and also other activities aimed at harvesting surface and groundwater, prevention of losses through evaporation and seepage and all other hydrological studies and engineering intervention, aim at conservation and efficient utilization of limited water endowment of physiographic union such as a watershed.

The various aspects covered under this definition, are.

1. Construction of permanent / portable storage structures for "in situ" collection of rainwater.
2. Farm ponds for collection of runoff, either for supplemental irrigation or for augmentation of groundwater.
3. Check dams for storing runoff in first order (small) streams.
4. Percolation tanks at appropriate sites for augmentation of groundwater.
5. Construction of ponds and reclamation / revitalization of tradition water arresting structures.
6. Artificial recharge through wells.
7. Reduction of evaporation from surface water bodies and soils.
8. Prevention of seepage losses in appropriate situations.
9. Subsurface dams to arrest base flow of groundwater.
10. Soil and water conservation practices comprising contour and terrace bunds.
11. Control of transpiration without affecting normal plant growth.

In general, water harvesting is the activity of direct collection of rainwater. Collected rainwater can be stored for direct use or recharged into the groundwater.

3.2.2 FROM WHERE TO HARVEST RAIN

Rainwater can be harvested from the following surfaces.

A. ***Rooftops:*** If buildings with impervious roofs are already in place, the catchments area is effectively available free of charge and they provide a supply at the point of consumption.

B. ***Paved and unpaved areas***: - i.e. Landscapes, open fields, parks (storm water drains), roads, pavements, and other open areas can be effectively used to harvest the runoff. The main advantage in using ground as collecting surface is that water has collected from a larger area. This is particularly advantageous in areas of low rainfall.

C. ***Water bodies***:- The potential of lakes, tanks and ponds to store rainwater is immense. The harvested rainwater not only is use to meet water requirements of the city but also to recharges groundwater aquifers.

D. ***Storm water drains***: - Most of the residential colonies have proper network of storm water drains. If maintained neatly, these offer a simple and cost effective means for harvesting rainwater.

However, the decision whether to store or recharge water depends on the rainfall pattern and the potential to do so, in a particular region. The sub – surface geology also plays an important role in making this decision.

3.2.3 TRADITION OF WATER HARVESTING

Water has harvested in India since antiquity. The first human settlement about 6000 years ago began a two –fold struggle with water. On the one hand, people had to protect themselves against flood and on the other hand, they had to ensure safe and adequate water supply for domestic use and irrigation. As a result, hydro- technical installations were among the earliest technological achievements of humankind. The first great civilization in the valleys of the Nile, Tigris, Euphrates, Indus and Huang rivers, flourished only based on good water management. The Arthastra of Kauitilya (321-297 BC) details the construction of rain harvesting structures for irrigation. Roof water harvesting in cisterns in Palestine and Greece date back to 2000 BC and the earliest dams in Jordan and Egypt date back to 3000 BC.

Indians over centuries developed a range of techniques for harvesting every possible form of water, from rainwater, stream and river water as well as floodwater. They are having tapped water from hill streams or springs known as kuhls carrying a discharge of 15-100 liters per second. In Meghalaya, a 200-years old system of tapping stream and spring water for irrigating plants by using bamboos still exists.

In study region, very few evidences of rainwater harvesting were observed. In 1896, Phaltan city was the Sansthan of Maratha Satta. The king of Phaltan Sansthan Raje Malojirao Naik Nimbalkar was famous for his great personality and social work. To solve the problem of drinking water, he planned the Nirgudi - Khajinahoud water supply scheme. Nirgudi village is located 15 km. south of Phaltan at elevation of 700 meters. 'Nir' means water and 'Gudi' means stored rain water place (Talab). In this talab (Tank), rainwater was collected in rainy season and was supplied to Phaltan city through saipan system.

In rural area of Phaltan tahsil ancient rain water harvesting systems are still in use. Small village ponds, for example Wathar Nimbalkar village pond has constructed in 1880.Village ponds were very important for domestic & livestock water use. Other villages like Nimblak, Rajale, Upalve, Mirde have small village ponds.

3.3 WATER HARVESTING IN THE STUDY REGION.

3.3.1 ROOF WATER HARVESTING :-

In this section, an attempt is made to review the water harvesting in the study region both in urban and rural areas. For urban area, 200 units including residential commercial & official units were selected by using random sampling method, whereas in case of rural area 30 villages covered under *'Jalswaraj Prakalp'* are selected for roof top water harvesting.

Formula used to calculate the Annual Rainwater Harvesting Potential (Pacey et.all 1989) is given below :

ARHP = R x AC x RC

Where,

ARHP	- Annual Rainwater Harvesting Potential
R	- Rainfall (mm)
AC	- Area of catchment (in sq.m.)
RC	- Runoff coefficient

Runoff Coefficient:-

Runoff coefficient is the factor, which accounts for the fact that not all the rain falling on catchments have collected. Some amount of rainfall lost from the catchment by evaporation and some amount has retained by surface itself. Accordingly, table no. 3.1 shows the Runoff coefficients for various surfaces of catchments.

Table 3.1

RUNOFF COEFFICIENTS FOR VARIOUS SURFACES

Types of catchments	**Coefficients**
Roof Catchment	
- Tiles	0.8 – 0.9
- Corrugated metal sheets	0.7 – 0.9
Ground surface coverings	
- Concrete	0.6 – 0.8
- Bricks Pavement	0.5 – 0.6
Untreated ground catchment	
- Soil on slopes less than 10 percent	0.1 – 0.3
- Rocky natural catchments	0.2 – 0.0

Source : Pecey, Amold and Cullis, Adrian (1989).

Traditionally, rain water harvesting comprises collection of the precipitation falling onto the roof or terrace of a building and storing it in a waterproof sump at ground level for use year round or in periods of scarcity of supply from other sources such as a pond or a well. Roof water harvesting had practiced as a matter of necessity mostly in the low rainfall (less than 500 mm) areas. Roof water harvesting and storage systems are very few in rural and urban area of Phaltan tahsil as people are less aware about rainwater harvesting system. Very few examples are observed in study region.

(a) Rural roof water harvesting scenario:-

Table 3.2 reveals the present position of roof water harvesting in rural water scenario. Out of 30 selected villages, only six villages are involved in the roof water harvesting techniques, particularly residential units, schools, office buildings. They are locally known as 'Shivkalin

PHALTAN TAHSIL : VILLAGES ADOPTING ROOF WATER HARVESTING SYSTEM (2005)

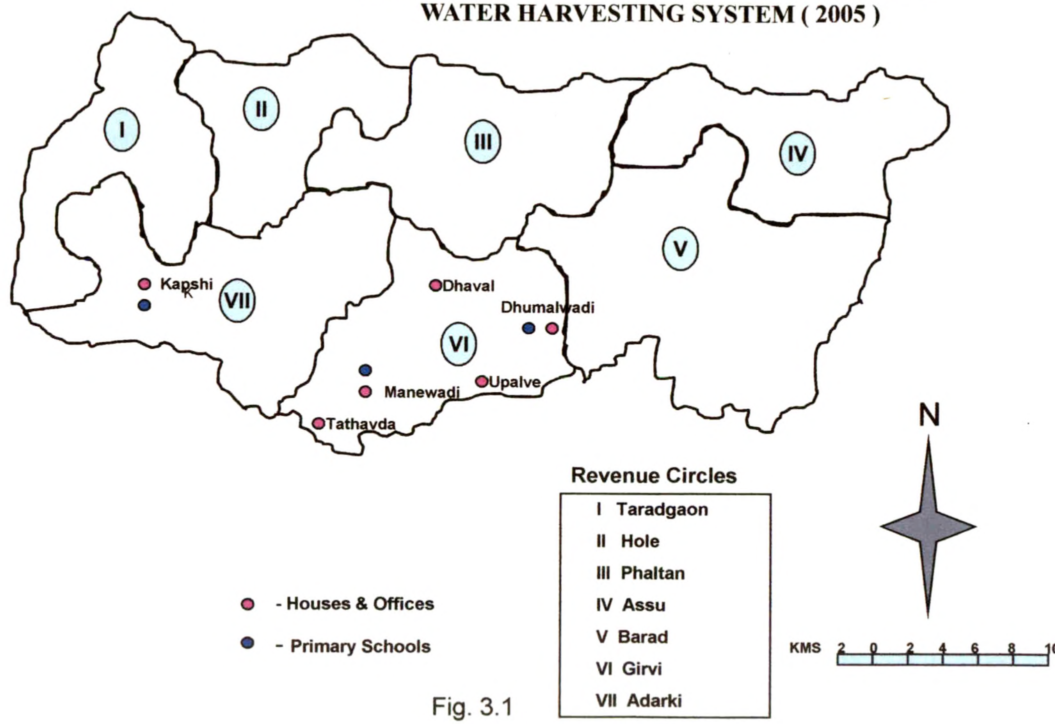


Fig. 3.1

Table 3.2
ROOF WATER HARVESTING IN RURAL WATER SENARIO (YEAR 2006)

Name of roof tops Place	Catchments surfaces types of roof tops	Total quantity (buldings)	Total catchment s in sq.m	Total annual water harvested in cubic meters	Use
Houses & Buildings (Individual)	Concrete	08	1645	658	Domestic & Ground water recharge
	Bricks	13	918	275.4	
	Metal sheet	18	1450	652.5	
	Tiles	06	288	129.6	
	TOTAL	**45**	**4301**	**1715.5**	
Primary Schools (Zilla Parishad) (Jalswaraj)	Concrete	02	506	202.4	Gardening & Ground water recharge
	Bricks	12	852	255.6	
	Metal sheet	11	737	331.65	
	Tiles	00	00	00	
	TOTAL	**25**	**2095**	**789.65**	
Administrative offices (Banks, Post & others	Concrete	07	1596	638.4	Gardening & Ground water recharge
	Bricks	00	00	00	
	Metal sheet	03	195	87.75	
	Tiles	01	165	74.25	
	TOTAL	**11**	**1956**	**800.4**	
Co-operative (Societies & others)	Concrete	01	237	94.6	Gardening, Processing & Ground water recharge
	Bricks	00	00	00	
	Metal sheet	00	00	00	
	Tiles	00	00	00	
	TOTAL	**01**	**237**	**94.6**	
	OVERALL TOTAL	**82**	**8589**	**3400.15**	

Source: Jalswaraj Prakalp Panchyat Samiti, Phaltan & field work

Pani Sathvan Yojana'. These villages are Kapshi, Manewadi, Tathavada, Dhaval, Upalve & Dhumalwadi; These villages together have harvested only 3400.15 cu.mtrs water.(Table 3.2 & Fig. 3.1).

Some primary schools of Zilla Parishad collect the rainwater through roof water harvesting system. For example, Manewadi, Kapshi and Dhumalwadi primary schools collect the rainwater and store in constructed cement tanks (5000 liters). Manewadi primary school use the storage water to recharge bore wells and it is use for watering tree plantation.

Very few examples observed regarding roof water harvesting in rural area of Phaltan tahsil. In modern era, the life stile of rural people is gradually changing resulting into increasing the demand of water. Therefore, to meet the increasing demand, the need of rainwater collection is most essential. In summer season, the scarcity of drinking water has been observed in 13 villages, out of 30 selected villages.

b) Urban roof water harvesting scenario:-

In Phaltan city, only 3050.95 cu.mtrs rainwater is collected from 7470 sq.mts. catchment area of rooftop (Table 3.3). Many buildings of Phaltan city are constructed in RCC, these buildings rooftops are good for collecting the rainwater but very few house holders practice roof rainwater harvesting. Individually eight concrete buildings in Phaltan city harvest and store the rainwater from the concrete surface catchments.

Table 3.3 reveals that 27 individual dwellings from Phaltan city have harvested 1783 cubic meters water which is used for domestic use as well as recharging the ground water. About 13 primary schools have harvested about 953.7 cubic meters of rainwater and utilized for ground water recharge and gardening. Similarly, administrative buildings and co-

Table 3.3
ROOF TOP RAINWATER HARVESTING IN URBAN WATER SENARIO (PHALTAN CITY) in 2006

Name of roof top places found in study region	Catchments surface types of rooftops	Total quantity (buildin gs)	Total catchme nt area in sq.m	Total annual water harvested in cubic meters	Use
Houses & Buildings (Individual)	Concrete	11	3354	1341.6	Domestic & Ground water recharge
	Bricks	03	213	63.9	
	Metal sheet	07	413	185.85	
	Tile	06	426	191.7	
	TOTAL	**27**	**4406**	**1783.05**	
Primary Schools (Nagarparishad)	Concrete	04	1500	600	Ground water recharge & gardening
	Bricks	00	00	00	
	Metal sheet	04	248	111.6	
	Tile	05	538	242.1	
	TOTAL	**13**	**2286**	**953.7**	
Administrative offices (Banks, Police station, Post & others)	Concrete	02	702	280.8	Domestic & gardening
	Bricks	00	00	00	
	Metal sheet	00	00	00	
	TOTAL	**02**	**702**	**280**	
Co-operative (Industries, Societies & others)	Concrete	00	00	00	Domestic , gardening & industrial use
	Bricks	00	00	00	
	Metal sheet	01	76	34.2	
	TOTAL	**01**	**76**	**34.2**	
TOTAl	**OVERALL**	**43**	**7470**	**3050.95**	

Source: Nagarparishad, Phaltan city & field work operative office buildings have harvested about 280 cubic meters & 34 cubic meters of water respectively and utilized for industrial, domestic and gardening purpose.

3.3.2 SURFACE WATER HARVESTING

Surface water harvesting (SWH) is the most common form of water practiced in the country. Harvesting of rainwater impounding it through tanks, ponds, check-dams and in minor irrigation projects is a well-understood practice used for the last 100 years. It not only provides enough water for drinking and agriculture in drought prone areas and elsewhere, but also helps in recharging the groundwater resources and sub-soil water levels (Radhakrishna, 2003).

(a) Farm ponds in cultivated area:-

The farm ponds are designed to harvest rainwater from the self-catchments are of pond during the rainy season. The harvested water is used to irrigate horticultural crops like mango, grapes and any other similar types of plants for their initial establishment. The primary function of farm ponds is to provide water for irrigation, livestock, drinking purposes. In building a good farm pond, watershed yield and soil suitability are of paramount importance.

The table 3.4 shows the distribution, quantity and impact of farm ponds in Phaltan tahsil. During the year of 1995 to 2000, only 24-farm ponds were constructed irrigating of 228 hectares of crop land. During the year of 2001 to 2005, the number raised up to 94 irrigating about 858 hectares of area and total water storage capacity is recorded 27 TCM

The Spatial distribution of farm ponds in Phaltan tahsil reveals that 22 ponds are observed in Barad, 18 in Giravi & 17 Adarki circles. Taradgaon & Assu circles have recorded 14 & 10 ponds each. The rest of

PHALTAN TAHSIL : DISTRIBUTION OF FARM PONDS
(2005)

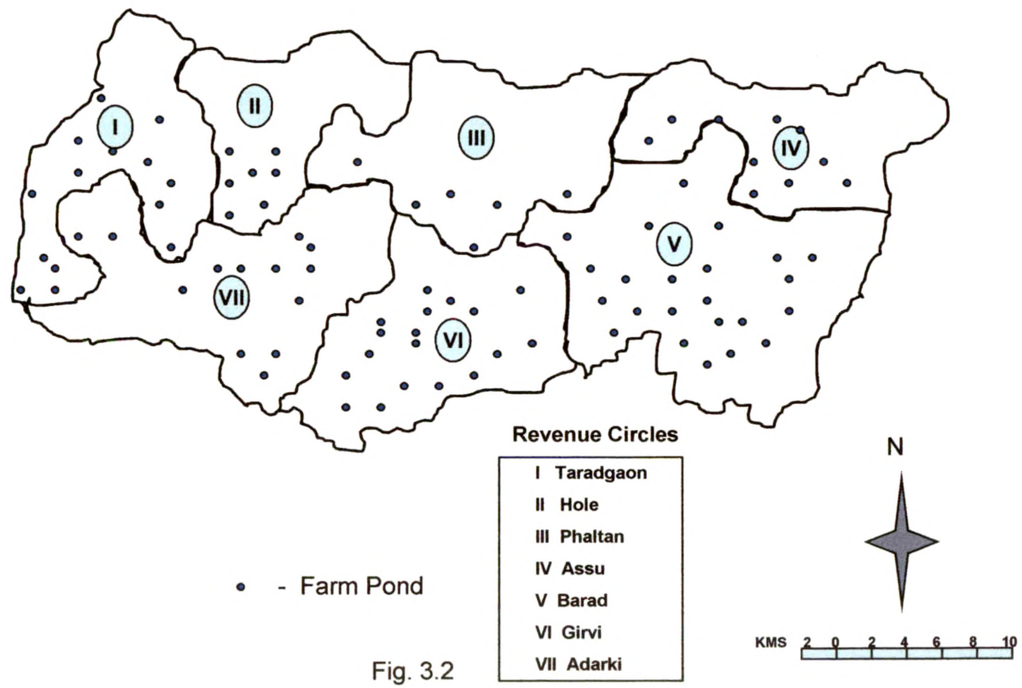
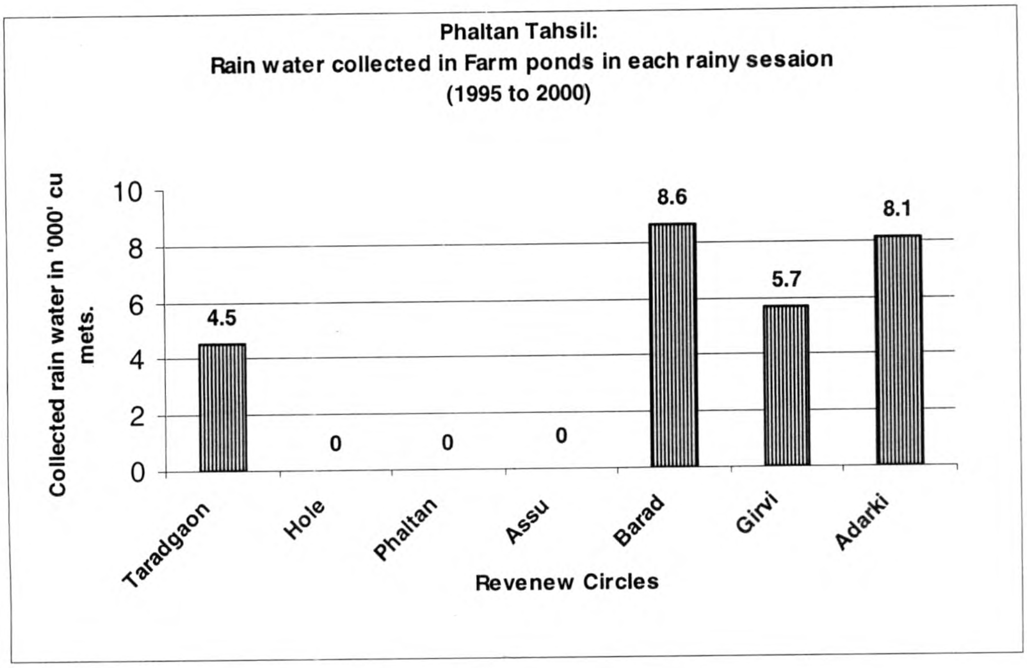


Fig. 3.2

Table 3.4
PHALTAN TAHSIL : FARM PONDS

Years	Mandal/ Revenue circle	Size (length × width × depth) in meters	Total quantity (number.)	Revenue Circles Total (number.)	Total water storage capacity (in TCM)	Revenue Circles Total (in TCM)	Average of water storage capacity in per pond (in TCM)	Net irrigated area under farm ponds (in hect.)	Revenue Circles Total (in hect.)	Average irrigated area under per farm ponds (in hect.)
1995	Tardgaon	20×20×3	03	04	3.6	4.5	1.2	30	38	10
		20×15×3	01		0.9		0.9	08		08
	Hole	20×20×3	00	00	00	00	1.2	00	00	10
		20×15×3	00		00		0.9	00		08
	Phaltan	20×20×3	00	00	00	00	1.2	00	00	10
		20×15×3	00		00		0.9	00		08
	Assu	20×20×3	00	00	00	00	1.2	00	00	10
		20×15×3	00		00		0.9	00		08
	Barad	20×20×3	05	08	6.0	8.7	1.2	50	74	10
		20×15×3	03		2.7		0.9	24		08
	Girvi	20×20×3	04	05	4.8	5.7	1.2	40	48	10
		20×15×3	01		0.9		0.9	08		08
	Adarki	20×20×3	06	07	7.2	8.1	1.2	60	68	10
		20×15×3	01		0.62		0.9	08		08
	Total (Phaltan tahsil)		-	**24**	-	**27**			**228**	
2005	Tardgaon	20×20×3	05	14	4.56	9.58	1.2	50	122	10
		20×15×3	09		5.02		0.9	72		08
	Hole	20×20×3	07	07	8.4	8.4	1.2	70	70	10
		20×15×3	00		00		0.9	00		08
	Phaltan	20×20×3	04	06	4.8	6.6	1.2	40	56	10
		20×15×3	02		1.8		0.9	16		08
	Assu	20×20×3	07	10	8.4	11.1	1.2	70	94	10
		20×15×3	03		2.7		0.9	24		08
	Barad	20×20×3	10	22	12	22.8	1.2	100	196	10
		20×15×3	12		10.8		0.9	96		08
	Girvi	20×20×3	11	18	13.2	19.5	1.2	110	166	10
		20×15×3	07		6.3		0.9	56		08
	Adarki	20×20×3	09	17	10.8	18	1.2	90	154	10
		20×15×3	08		7.2		0.9	64		08
	Total (Phaltan tahsil)			**94**		**95.98**			**858**	

Source : Govt. of Maharashtra Agriculture Dept. Phaltan Tahsil. (Soil & Water conservation cell)



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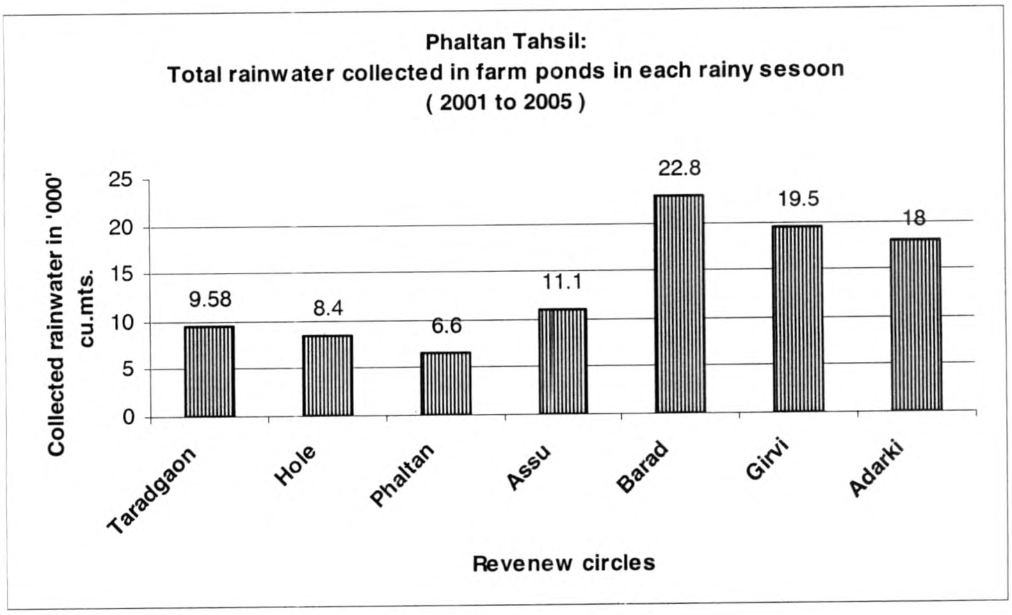


Fig No.- 3.4

Water storage capacity in farm pond

Size - i)20×20×3 – 1.2 TCM
ii)20×15×3 – 0.9 TCM

Need of average rainfall is 500 mm

Fig No.- 3.5

Source: Govt. of Maharashtra Agriculture Dept. Phaltan Tahsil. (Soil & Water conservation cell) the circles have less than 10 farm ponds in the tahsil. All these ponds have irrigated about 858 hectares of cropland in the tahsil. Total water storage capacity is 95.98 TCM. (Table 3.4 & fig. 3.3 & 4)

(b) Check Dams:-

In the management of water, self-help is the best help. A simple and cheap method of harvesting rainwater through check dams/ small percolation tanks or *Johads* are drastically transforming lives in various villages of drought prone area in Phaltan tahsil. Villagers worked as laborers. The water harvesting through construction of small percolation tanks began in the drought year of 1972 and gave sense of ownership over water-bodies Employment guarantee scheme (*Rojagar Hami Yojana*) has helped to build nearly 170 locally owned water-harvesting projects in Phaltan tahsil. 'Soil and Water conservation department of Maharashtra government' has helped and guided to build over 150 check dams on streams of south western hilly region of Phaltan tahsil. (Photo Plate 3.3).

In the year 1975, only five check dams were constructed facilitating irrigation water to about 61 hectares of cropland. Subsequently the number of check dams goes on increasing up to 150 in the year 2005, irrigating over 1090 hectares agricultural land. (Table 3.5 & Fig. 3.6,7&8). These check dams have provided the water for livestock and recharging the ground water as well. Most of the check dams are constructed through Employment Guarantee Scheme of State Government.

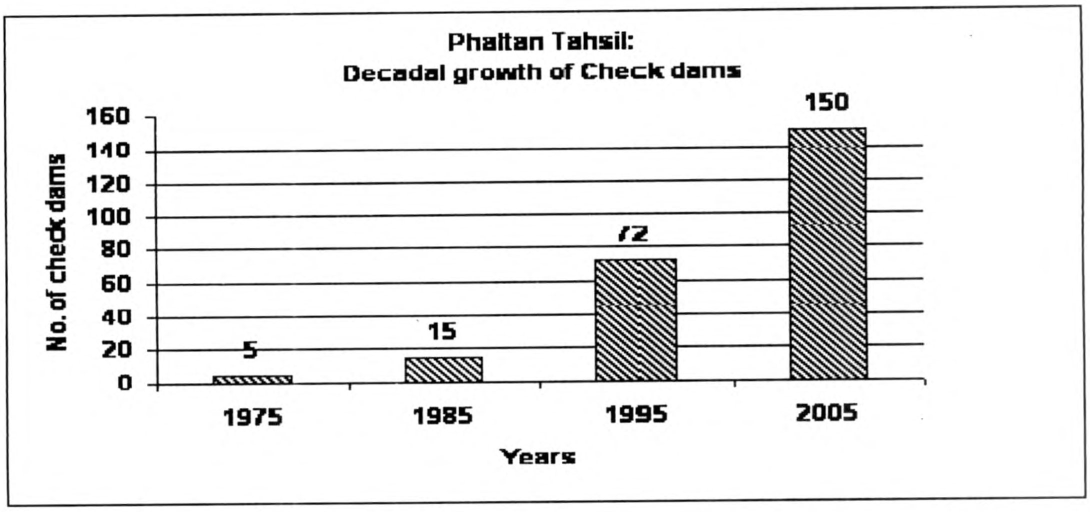
(c) Percolation tanks

Percolation tanks refer to an artificial tank mainly developed to store the water and to enrich water table in down stream areas.

Table 3.5
PHALTAN TAHSIL : DECADAL GROWTH AND IMPACT OF CHECK (CEMENT) DAMS

Years	Quantity (in number)	Total catchment area in hectare	Average of catchment area in per tank in hect.	Aver age rainf all in mm	Water storage capacit y in cu.mts (000) TCM	Impact & Use of SWH	
						Irrigate d area influenc ed by check dams (In hect.)	Other use
1975	05	40	8	450	4.5	61	Recharging ground water
1985	15	120	8	345	12.5	162	Recharging ground water
1995	72	491.76	6.83	553	58.8	474	Recharging ground water
2005	150	634	4.22	538	97.3	1090	Recharging ground water

Source – Agriculture & Irrigation Department of Phaltan Tahsil



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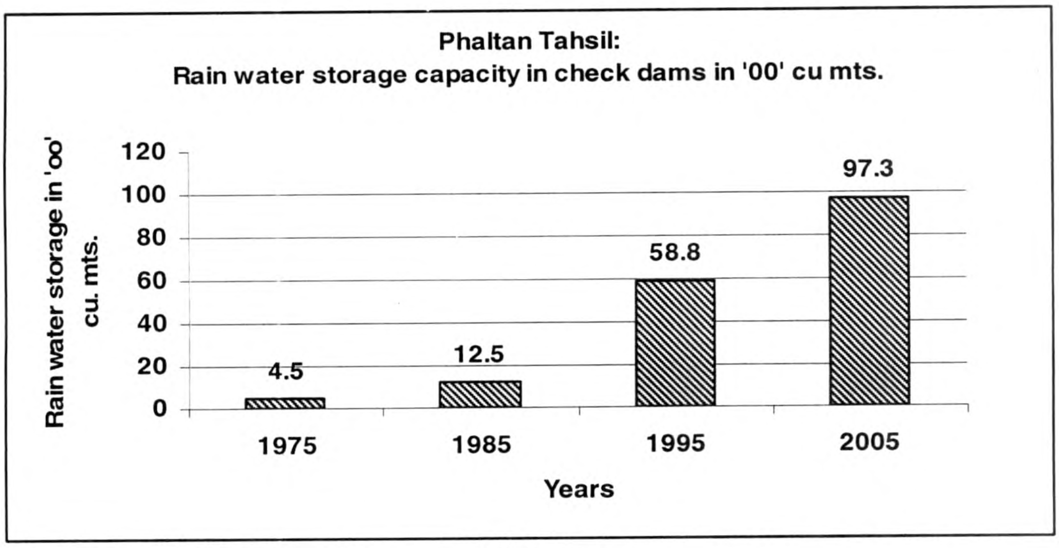

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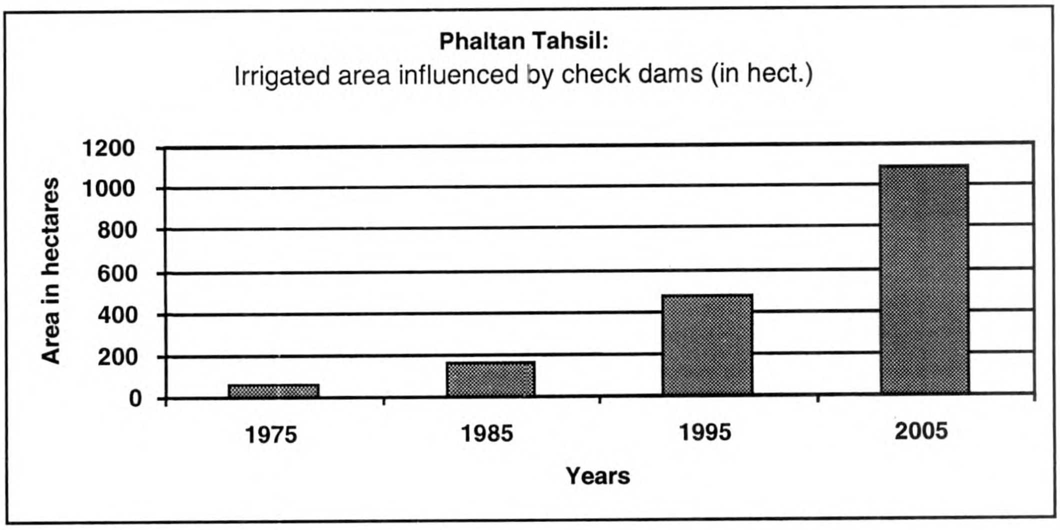


Fig No.- 3.8

Source – Agriculture & Irrigation Department of Tahsil

The device of tapping rainwater has been emerged during the last three decades in famine affected areas. Although the concept of water percolating tank is the recent advancement in the field of irrigation, it has many fold effects on agriculture landscape. As such, the percolation tanks have become new phenomena in the drought prone area of Maharashtra. It has enabled to increase the water level in the wells, yield & duration of water in the wells (Pawar 1989). The Fact Finding Committee also states (Govt. of Maharashtra, 1973) that ground water potential of the area supported by the percolation tank has increased almost threefold.

In the study region, nine percolation tanks have constructed in various years. The oldest one is Banganga percolation tank, which has constructed in the year 1955, having 127 hectares are of catchment area and 6.51 TCM storage capacities. This tank has facilitated over 1000 hectares of cultivated land. (Table 3.6) Similarly, during nineteen seventies another six percolation tanks have constructed and two more in next decade.

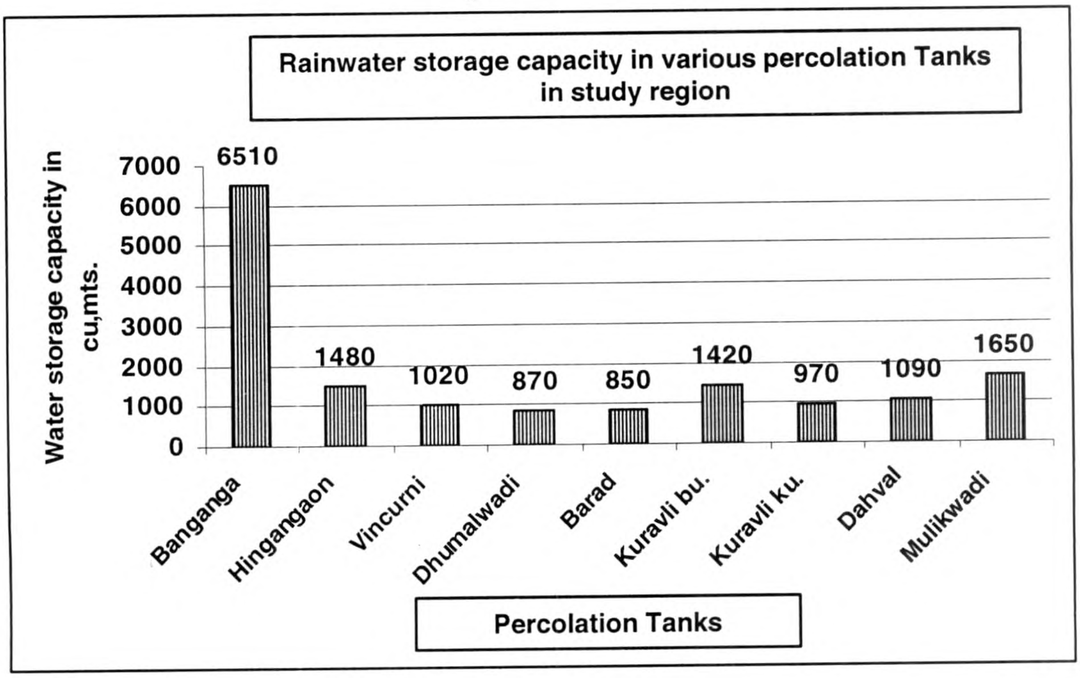
The total benefited area by these percolation tanks comes to about 2329 hectares. This is a big achievement in the region. The water storage capacity of all these percolation tanks ranges between 850 cubic meters to 1650 cu. miters except Banganga percolation tank, whose storage capacity is 6510 cub. mtrs. (Fig. 3.10)

In the study region well is the major source of irrigation (60.58 % of total irrigated area in 2005) followed by canal irrigation (32.77%) (Table no. 2.11). At present, there are 9074 dug wells in the region as again 8338 dug wells in the 1975. The note worthy thing is that the number of bore has increased significantly from 997 in 1975 to 16080 in the year 2005. (Fig. 3.11) This increase in both dug wells and bore wells

Table 3.6
PHALTAN TAHSIL : PERCOLATION TANKS

Sr.No	Name of tanks	Work completed year	Water storage capacity in cu.mts TCM	Catchment area in hectares	Benefited area in hectares
1	Banganga	1955	6.51	127	1036
2	Hingangaon	1975	1.48	54	208
3	Vincurni	1975	1.02	50	135
4	Dhumalwadi	1976	0.87	48	192
5	Barad	1978	0.85	47	102
6	Kuravli bu.	1978	1.42	52	133
7	Kuravli ku.	1978	0.97	51	147
8	Dahval	1984	1.09	53	157
9	Mulikwadi	1986	1.65	57	219
		Total	**15.86**	**539**	**2329**

Source:- Irrigation Dept. Phaltan Tahsil



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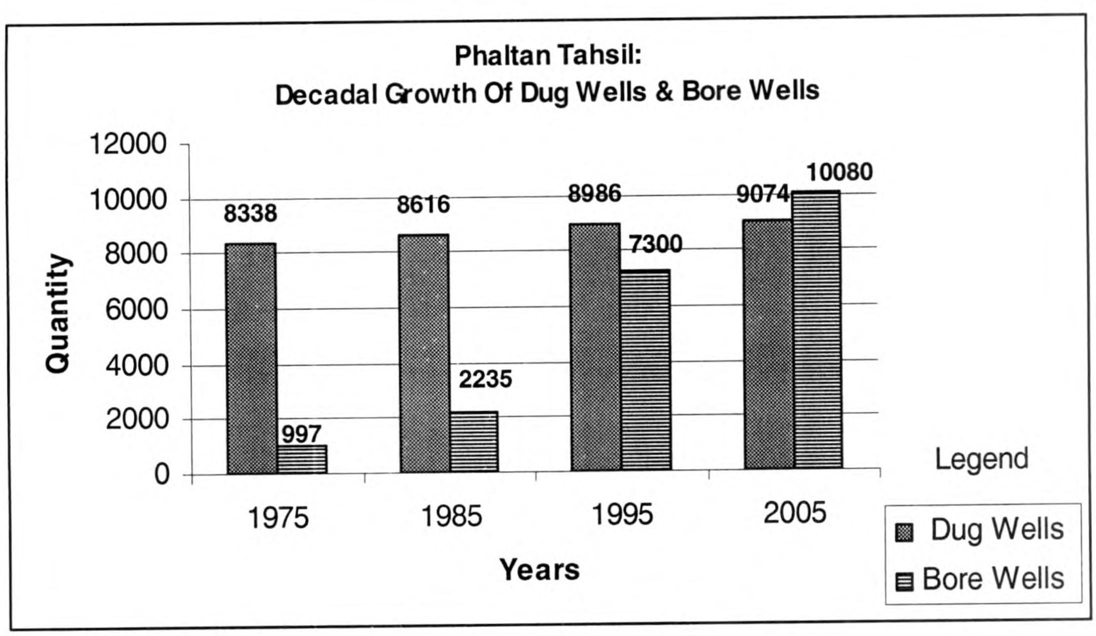

Fig No.- 3.10

Source: District socio-economic abstract 1995-2005 & Tahsil Office Record.

can be well attributed to the increased recharge of ground water level due to the construction of percolation tanks.

(d) Contour furrow -

The contour buonding system helps both in soil & water conservation. Table 3.7 reveals that during 1975 only four villages were brought under this scheme facilitating only 300 hectares of land. However, in subsequent year number of benefited villages increased up to 97 facilitating above 10000 hect. of land. This has helped mostly in recharging the groundwater. This scheme is mainly practiced in central and southern hilly parts of the region.(Photo Plate 3.5)

(e) Nalla bunds

Nalla bunds usually consist of constructing soil bunds of suitable dimensions across the Nallas or Gullies to hold the maximum runoff water. It helps in water harvesting, moisture control and ground water recharge. The number of such bunds primarily depends upon the slope of the Gully or the Nalla and the quantity of runoff. Nalla bunds also help to increase the groundwater recharge. It may not be advisable to construct Nalla bunds on Nalla with high gradient slope where runoff of water flow is very high particularly in the southern hilly ranges. In the study area about 104 Nalla bunds have been constructed in villages of Adarki, Girvi and Barad circles (Photo Plate 3.6).

3.3.3 GROUND WATER HARVESTING:

The dug wells are the traditional ground water harvesting devices. The tube wells and bore wells are relatively modern. The dug wells withdraw water from the top aquifer. The bore wells generally tap the deeper aquifer layers which are confined or under pressure. The number

Table 3.7

PHALTAN TAHSIL : DECADAL GROWTH & IMPACT OF CONTOUR BUNDS (1975 – 2005)

Years	No.of villages	Area in hect.	Use & impact
1975	04	300	Ground water recharge
1985	17	2798	Ground water recharge
1995	32	7525	Ground water recharge
2005	97	10346	Ground water recharge & increase in Social forestry

Source – Government of Maharashtra, Agriculture Department of Tahsil

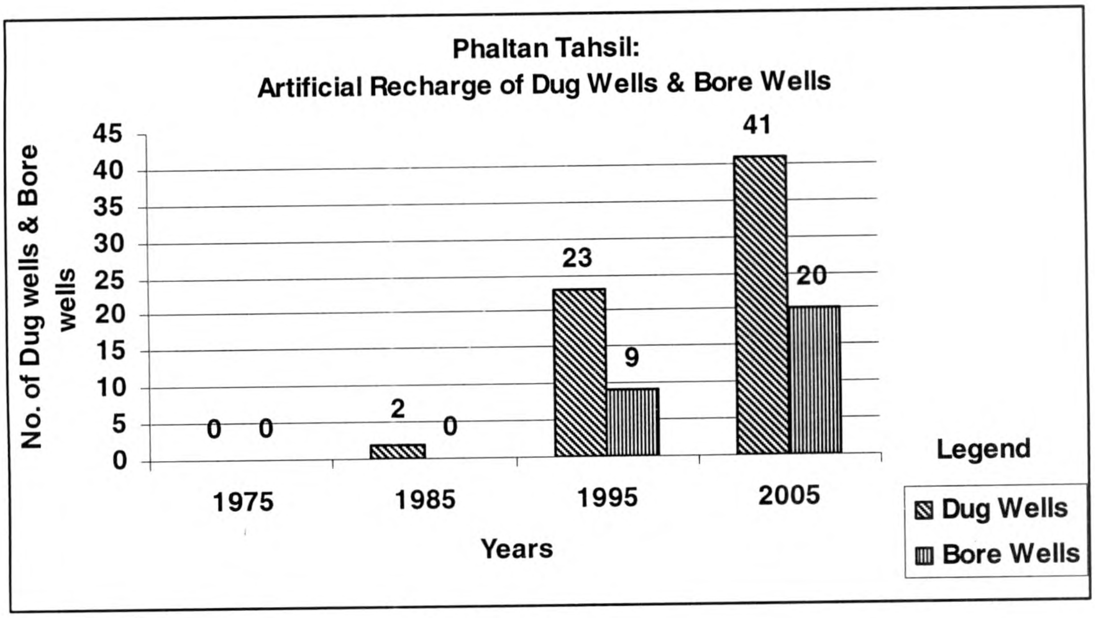

Fig. 3.11

Source – Jalswaraj Prakalpa Panchyat Samiti Phaltan of bore wells has increased phenomenally over last few decades, e.g. in 1975 the number of wells & bore wells were 8338 & 997 respectively those have increased up to 9074 and 10080 in 2005 respectively in the study region.

The excessive use of well water for drinking & irrigation purpose is observed in Barad, Girvi, and Adarki circles, resulting into decreasing ground water level up to 12 meters. To minimize this problem development of ground water harvesting techniques have been adopted in these circles. Artificial recharge helps in reducing concentration of these hazardous substances. For detail study researcher, has observed two types of ground water harvesting techniques they are as follow:

(a) *Subsurface Barriers* -

Subsurface barrier comprises ground water – arresting structures. This is appropriate for areas drained by narrow valleys and having good porous material in the form of colluviums or valley construction of subsurface dams or barriers across the streambeds has used for harvesting the ground water by preventing the base flow discharge. Construction of subsurface dams has illustrated by three examples. The subsurface dam or dyke has sometimes referred as a device for artificial recharge. However, its function is that of a structure which harvests that quantum of groundwater, which, in natural circumstances, would have left the area as a base flow.

In the study region, one subsurface dam is located at Dumalwadi village. The rock formation in this area is Deccan basalt trap and the seasonal rainfall in this area is 500 mm. This site is hilly having narrow valley shape for the underground bund having a sandy bed, and the bed must continue into alluvial banks. A trench is to be constructed across the

'Dumalwadi Odha' it backfill pit is covered again with the excavated material, spread on it in the shape of a flat, streamlined hump.

(b) ***Groundwater Harvesting through Aquifer Transfer:***

The term 'Artificial Recharge' refers to transfer of surface water to subsurface aquifer through human intervention. Argumentation of groundwater resources through artificial recharge has considered as an activity, which supplements the natural process of recharge, which takes place through the percolation of a fraction of the rainfall through the soil to the water table. Artificial recharge becomes relevant in the situation witnessed in India, where the rainfall is seasonal and is not spread uniformly over the year and the quantum of natural recharge is inadequate to meet the increasing demand on groundwater resources.

Artificial recharge has considered, as a form of water harvesting in which the surface water stored or flowing out of a watershed or basin during the rainy season had transferred to the aquifers utilized in other months of the hydrological year. This water would be otherwise lost through evaporation or outflow from the watershed.

Fig. 3.9 reveals that in 1975, in the region, there were 8338 dug wells & 997 bore wells could not practice any one of artificial recharge techniques. In the year 1995, only 23 dug wells and 9 bore wells were recharged through rainwater harvesting like rooftops and surface rainwater harvesting (Photo plate 3.7). In the year 2005, the number of dug wells raised up to 41 and bore wells up to20. However during last decade the depletation of ground water is remarkable (8mts) which needs the artificial recharge of groundwater on large scale.

Table 3.8
PHALTAN TAHSIL : ROOF TOP WATER HARVESTING (2006)

Roof water harvesting region	Quantity (buildings)	Total catchments area in sq.meters	Total Rain water collected in cu.meters	Water available Period (Months)	Use & Impact
Urban	43	7470	3050.95	July to Oct.	Domestic, industrial ground water recharge & gardening
Rural	82	8589	3400.15		
Total	125	16059	6451.1		

Table No. 3.9
PHALTAN TAHSIL : SURFACE WATER HARVESTING (2006)

Types of SWH	Quantity	Total catchments area in hectors	Water storage capacity in (000) TCM	Water available Period (Months)	Use & Impact of SWH	
					Use	Net irrigated (Area in hect.)
Farm Ponds	94	470	95.98	July to Jan.	Only Irrigation	858
Check Dams	150	634	97.3	July to April	Irrigation & Livestock	1090
Percolation Tanks	09	539	158.6	July to Feb.	Irrigation, Domestic & Livestock	2329
Total	253	1879	351.7	-	-	4277

Source: Tahsil Agriculture & Irrigation office.

ROOF TOP RAINWATER HARVESTING AT MANEWADI

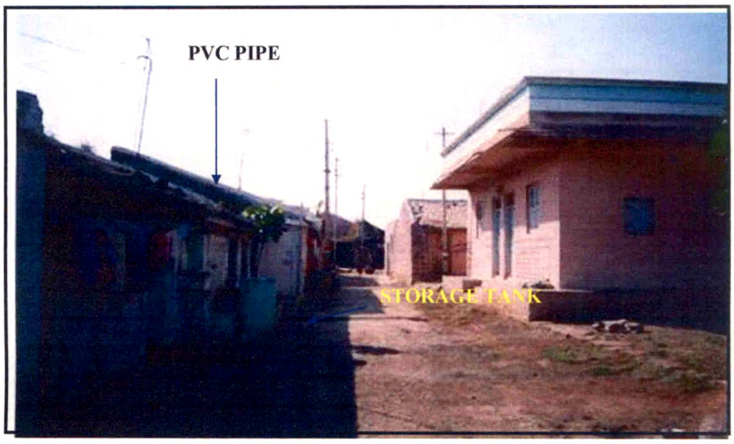

Photo plate no. 3.1

FARM POND AT KAPSHI VILLAGE

Photo plate no. 3.2

CEMENT CHECK DAM ACROSS THE KARANJ ODHA NEAR

Photo plate no. 3.3

PERCOLATION TANK NEAR DUDHEBAVI VILLAGE

Photo plate no. 3.4

CONTOUR BUNDS NEAR BIBI VILLAGE

Photo plate no. 3.5

NALLA BUNDS (STONE BUNDS) NEAR MANEWADI VILLAGE

Photo plate no. 3.6

WELL RECHARGE THROUGH SURFACE RUNOFF AT ADARKI VILLAGE

Photo plate no. 3.7

NEW PERCOLATION TANKS CONSTRUCTED AT FOOT HILLS OF TATHAWDA GHAT

Photo plate no. 3.8

SUMMARRY

As mentioned earlier, in the study region the rainwater harvesting is not a new concept. The methods of 'Collecting and conserving water' are traditional. But slowly with the advent of tap water, rain water harvesting has lost its importance. Now Phaltan tahsil is in a situation where efficient management of water resources has become a necessity. Rainwater harvesting has come to the limelight again as a strategy for meeting human needs.

Some villages of Phaltan tahsil like Nirgude, Wathar Nimbalkar, Mirde, Rajale conserve and collect rainwater in village ponds traditionally. These villages adopted rainwater-harvesting techniques about 100 years ago. In rural area out of selected 30 villages, only 6 villages practice the rooftop rain water harvesting system. Whereas in Phaltan city 3050cu meters annual rainwater is collected (2006) through roof water harvesting technique.

Construction of a few Surface Water Harvesting structure in some villages led to a remarkable rise in the local water table and as a result, the movement spread over the region. At the end of 2006, about 170 water-harvesting structures (Farm Ponds, Check Dams & Percolation tanks) have constructed in about 117 villages of the Phaltan tahsil. Other activities such as Contour Bunds & Nalla Bunds are constructed through surface water harvesting system. Out of 9074 dug wells & 10080 bore wells only 41 dug wells & 20 bore wells are artificially recharged (2005) through ground water harvesting system.

A few visible impacts are observed regarding water harvesting in study region. At present, partly demand of drinking and domestic water has been partly solved through roof water harvesting in rural and urban area. The net result of SWH on soil and water conservation has found in southern hill slope region of Adarki, Girvi & Barad revenue circles. The farmers started getting more yields because of avaibility of supplemental irrigation and could grow two crops in a year. Some additional land has brought under cultivation, some fodder is available and milk production has increased because of water harvesting systems applies in study region. About 3732 hectares of uncultivated area have been facilated by seasonal irrigation from ponds, small tanks, check dams and percolation tanks. Manewadi, Dhaval, Girvi, Dhumalwadi, Kapshi villages are rewarded National Prize of various activities of water conservation programmes like *'Mahatma Phule Jalsandhagaran Abhiyan'*.Migration of many males to cities for employment had reduced (personal observation). However, the increasing pressure of population needs to undertake various water harvesting schemes to mitigate the increasing demand for water.

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