CHAPTER - I

INTRODUCTION

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1.1 INTRODUCTION

Water is an inseparable entity within the life support system. Access to water of required quality and quantity is fundamental for all human, animal & plant life along with most economic activities. Availability of clean water for drinking, cooking, bathing & other household needs is necessary. A country's level of freshwater use reflects its level of economic development. In the developing region of the world people, use far less water per capita than in developed region. Developing countries devote most of their water supplies for agriculture. India uses about 90% of all water supplies for agricultural purposes, with just 7% for industry & 3% for domestic use. However, this essential resource is under threat. The challenges of growing water scarcity is heightened by the increasing cost of developing new water sources, soil degradation in the irrigated areas, ground water depletion, water pollution, and degradation of water-related ecosystem.

Only a tiny fraction of the planet's abundant water is available to use as fresh water. About 97.5% of total water is found in the oceans, which is not useful for drinking, irrigation or industry. The remaining 2.5% is fresh water of which 2.49% of this is locked in ice caps or glaciers or is buried too deep to extract. Only about 0.003% of earth's total volume of water is easily available to us as soil moisture, exploitable ground water, water vapour, lakes and streams. However, differences in average annual precipitation divide the world into water "haves" & "have-nots". Also increase in population & industrialisation intensifies water shortages in already water short regions. Projected global warming also causes change in rainfall patterns & disrupts water supplies. Hence, it is necessary for users to store rainwater.

Surface water is inadequate to meet our demand and we have to depend on ground water. In areas where there is inadequate ground water

supply or surface resources are either lacking or insufficient, rainwater harvesting offers an ideal solution.

1.2 THE PROBLEM

Rainwater is the primary source of all fresh water. Rivers, lakes, ponds and ground water are all secondary sources of fresh water as they are all stores and channels of rainwater. So, in order to meet demand, then what we actually need to do is harvest the rain. Water harvesting has aimed at understanding the value of rain and to make optimum use of rainwater at the place where it falls. We have a lot of rain, yet we do not have water. This is because we have rainfall in short spells of high intensity. Due to this intensity and short duration of heavy rain most of the rain falling on surface tends to flow away rapidly leaving very little for the recharge of ground water means harvesting the rain. So it is necessary for users to collect and store rainwater.

In the watersheds, harvesting of rainwater (surface runoff) is done by the construction of check dams (across stream lets, streams, rivulets) dug out ponds, sunken ponds (where soil thickness is more than 2m) embankment farm ponds, percolation tanks etc.

The harvesting of rainwater in the above said structures has shown tremendous impact on ground water recharge, which improved irrigation facilities and drinking water conditions as evident from some of the case studies. The rainwater that falls on the surface / rooftop is guided to bore wells or pits or new / old abandoned well through small diameter pipes to recharge the underground water, which can be harvested to the extent of 55000 liters per 100 sq. meters area per year. (Athavle, 1998). As such, rainwater harvesting could be the best way for mitigating the water scarcity in semi-arid areas where annual rainfall is 300 to 500 mm (Reddy , 1988). The selected study region lies in semi-arid zone of western

Maharashtra, where rainwater harvesting a simple economical and eco-friendly method of water conservation is an ideal solution to recharge the groundwater.

1.3 OBJECTIVES

In view of the above, present investigation aims:

1. To study the geographical setting of the region as a basis for the rainwater harvesting.
2. To examine the need of rainwater harvesting in Phaltan tahsil
3. To study the present position of rainwater harvesting in Phaltan tahsil
4. To assess the impact of present rainwater harvesting practises
5. To look in to the rain water harvesting potential
6. To recommend the viable measures of rainwater harvesting for study region

1.4 DATA SOURCE AND METHODOLOGY

The importance of the study lies in the fact that most of the facts and figures are collected through intensive fieldwork. The primary data related to relief, slope, rainfall, temperature, evaporation, transpiration has been collected through intensive fieldwork by applying schedule, interview, observation and questionnaire techniques. The secondary data has been referred from the published records such as Socio-economics reviews and District Statistical Abstracts, Census handbook, ,Government Reports related to water policy issues etc. The periodicals and unpublished documents related to water conservation are also referred.

Phaltan taluka in Satara district is chosen as the study region whereas some villages are selected for micro level unit for study.

The collected data and information has processed and analysed by using statistical techniques such as percentage, mean, coefficient of

correlation etc. Based on the various factors the roof water harvesting potential of a study region is estimated by using the following formula.

Annual Rainwater Harvesting Potential =
Rainfall (mm) X Area of catchments X Runoff coefficient.

Source: Pacey, Arnold and Cullis, Adrian 1989

The help of GIS technique (software) has been taken for drawing the Relief, Soil, Drainage, Land use and Geomorphology maps of the region. The graphs, isoline maps, diagrams, etc. are used for representing the collected data. The details of the particular methodology have seen explained in the text at appropriate place.

1.5 THE STUDY REGION

Phaltan tahsil, a part of Nira river basin, is one of the economically prosperous tahsils of Satara district in south Maharashtra. It lies between 17° 58' north to 18° 5' north latitudes and 74° 10' east to 74° 40' east longitudes (Fig.1.1). The region covers 1180.50 sq.kms area (11.26% of the district) comprising 117 villages and 1 urban centre. It is divided into 7 revenue circles (Fig 1.2). It has a population of 313657 (10.98 percent of the district) out of which 262827 is rural and 50800 is urban, with a density of 297 sq.km.(Table 1.1)

Nira River forms northern boundary between Pune and Satara districts, whereas eastern border has been delimited by Solapur district. The region attains 750 metres height (M.S.L.) with northward slopping land drained mainly by Banganga, a right bank tributary of the Nira river.

The hilly region occupies 10 percent (118.05 sq.km.) of the tahsil area which is the part of Mahadeo ranges having more than 900 metres altitude. The slope conditions (moderate to steep) have restricted the development of irrigation and agriculture as well. Towards the north, parallel to Nira river, transitional belt has been characterised by partial development of irrigation. This zone has been covered by alternate small

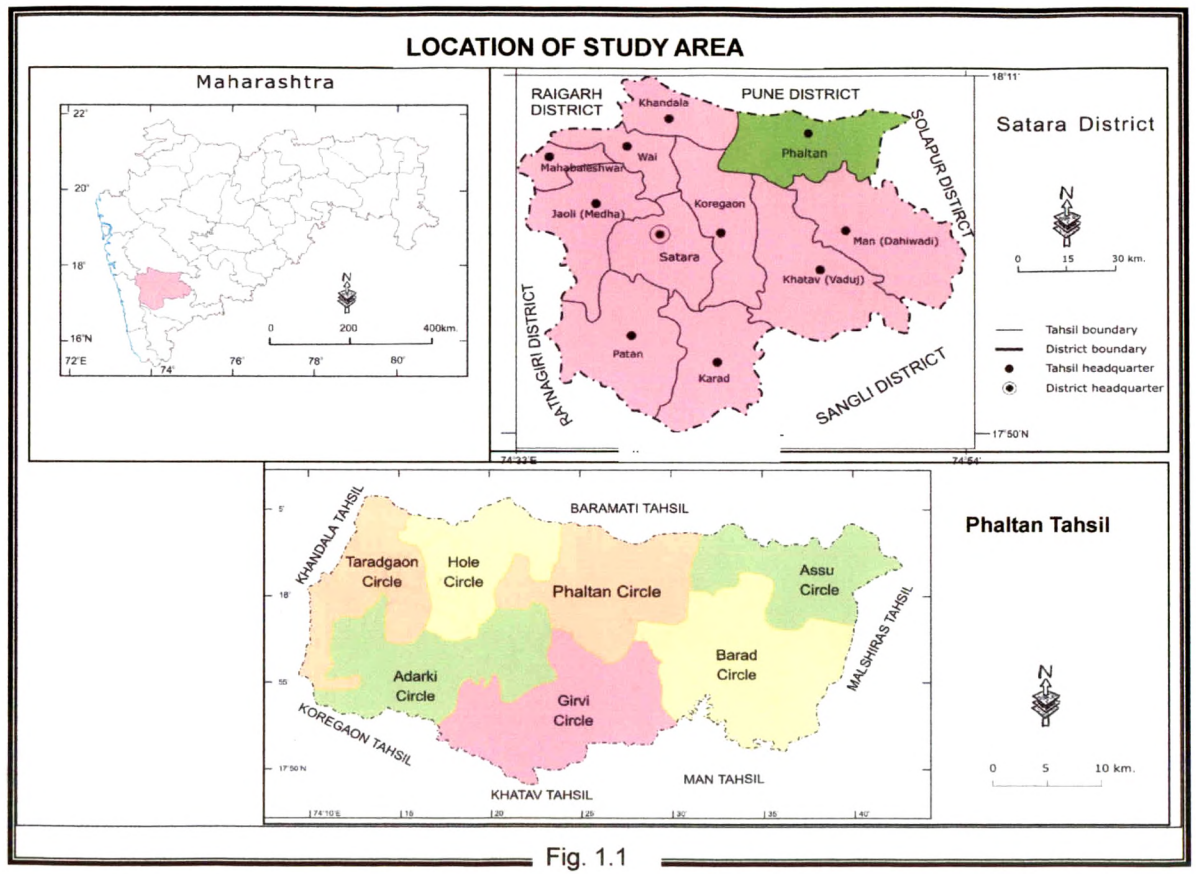

LOCATION OF STUDY AREA
Maharashtra
22°
20°
18°
16°N
72°E
74°
76°
78°
80°
0
200
400km.
N
RAIGARH DISTRICT
PUNE DISTRICT
SOLAPUR DISTRICT
RATNAGIRI DISTRICT
SANGLI DISTRICT
Khandala
Wai
Mahabaleshwar
Phaltan
Jaoli (Medha)
Koregaon
Satara
Man (Dahiwadi)
Khatav (Vaduj)
Patan
Karad
18°11'
17°50'N
74°32'E
74°54'
Satara District
0
15
30 km.
Tahsil boundary
District boundary
Tahsil headquarter
District headquarter
KHANDALA TAHSIL
BARAMATI TAHSIL
MALSHIRAS TAHSIL
KOREGAON TAHSIL
KHATAV TAHSIL
MAN TAHSIL
Taradgaon Circle
Hole Circle
Phaltan Circle
Assu Circle
Adarki Circle
Girvi Circle
Barad Circle
17°50'N
74°10'E
Phaltan Tahsil
0
5
10 km.

Fig. 1.1

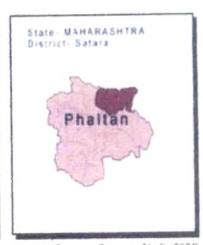
Table 1.1

Area Profile

SubDistrict : Phaltan

District : Satara

State : Maharashtra



(Source : Census of India 2001)

Number of Households	61,275

Household size	5.0
Proportion of Urban population (%)	16.2

	P	M	F
Population - Total	313,627	160,553	153,074
Population - Rural	262,827	134,618	128,209
Population - Urban	50,800	25,935	24,865
Population (0-6)	41,838	22,096	19,742
SC Population	43,224	22,029	21,195
ST Population	2,508	1,237	1,271

Sex Ratio (females per 1000 males)	953
Sex Ratio (0-6 Years)	893
Sex Ratio (SC)	962
Sex Ratio (ST)	1027

	P	M	F
Proportion of SC population (%)	13.8	13.7	13.8
Proportion of ST population (%)	0.8	0.8	0.8

Number of literates	205,987	118,246	87,741
Number of illiterates	107,640	42,307	65,333

Literacy Rate (%)	75.8	85.4	65.8
Illiteracy Rate (%)	39.6	30.6	49.0

Total workers	144,552	85,303	59,249
Main workers	123,343	79,016	44,327
Marginal workers	21,209	6,287	14,922
Non workers	169,075	75,250	93,825

Work Participation Rate (%)	46.1	53.1	38.7
Proportion of Main Workers (%)	39.3	49.2	29.9
Proportion of Marginal Workers (%)	6.8	3.9	9.7
Proportion of Non Workers (%)	53.9	46.9	61.3

Cultivators	60,064	33,166	26,898
Agricultural labourers	41,885	18,255	23,630
Workers in household industries	3,906	2,072	1,834
Other workers	38,697	31,810	6,887

Proportion of cultivators to total workers (%)	41.6	38.9	45.4
Proportion of agricultural labourers to total workers (%)	29.0	21.4	39.9
Proportion of workers in household industries to total workers (%)	2.7	2.4	3.1
Percentage of Other workers to total workers (%)	26.8	37.3	11.6

Prepared and issued by : Data Dissemination Wing, Office of the Registrar General, India 2A, Mansingh Road, New Delhi - 110 011, India
Website : http://www.censusindia.net E-mail : rgoffice@censusindia.net
Software designed and developed by : C-Three-I Systems Pvt. Ltd., New Delhi - India. E-mail: c3isystems@vsnl.com

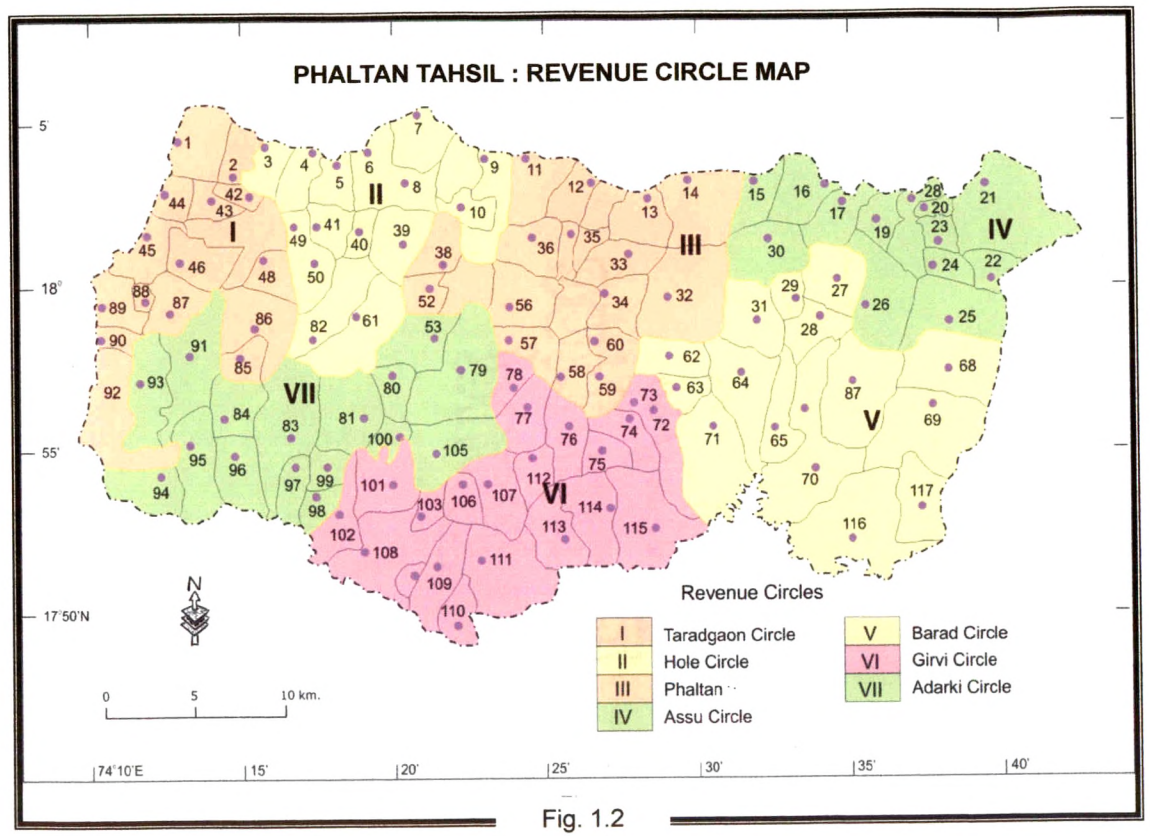

PHALTAN TAHSIL : REVENUE CIRCLE MAP
I
II
III
IV
V
VI
VII
Revenue Circles
I Taradgaon Circle
II Hole Circle
III Phaltan
IV Assu Circle
V Barad Circle
VI Girvi Circle
VII Adarki Circle
N
0 5 10 km.
5'
18°
55'
17°50'N
74°10'E
15'
20'
25'
30'
35'
40'

Fig. 1.2

Table 1.2 PHALTAN TAHSIL : REVENUE CIRCLE & VILLAGES AS PER CODE NUMBERS

Sr. No.	Revenue Circle & Village Name	Village code	Sr. No.	Revenue Circle & Village Name	Village Code No.
I	**TARADGAON**		41	Vidani	32
1.	Taradgaon	47	42	Sastewadi	35
2.	Vitthalwadi	48	43.	Choudharwadi	36
3.	Saswad	86	44.	Sangavi	14
4.	Takubachiwadi	85	45.	Nimbhore	38
5.	Kusur	2	46.	Kashidwadi	54
6.	Shindemala	43	47.	Dhavalewadi	52
7.	Malyachamala	42	48.	Vadjal	55
8.	Kapadgaon	45	49.	Jadhavwadi	58
9.	Koregaon	44	50.	Farandwadi	56
10.	Salpe	92	51.	Takurki	57
11.	Koparde	90	52.	Kolki	60
12.	Tambave	89	53.	Zirapwadi	59
13.	Chambharwadi	88	**IV.**	**ASSU**	
14.	Kurvali Bh.	70	54.	Assu	21
15.	Padegaon	1	55.	Hanumantwadi	22
16.	Aradgaon	87	56.	Jadhavwadi	24
17.	Chavanwadi	46	57.	Shindemala	23
II.	**HOLE**		58.	Pawarwadi	20
18.	Hole	7	69.	Dhawalewadi	26
19.	Pimpalwadi	8	60.	Gunaware	17
20.	Khamgaon	6	61.	Sathe	16
21.	Murum	5	62.	Sarde	
22	Tadavale	41	63	Mirdhe	
23	Ravadi kh.	3	64.	Khatakewasti	19
24	Ravadi Bk.	4	65.	Rajale	30
25	Kalaj	50	66.	Songaon	15
26	Dhombalwadi	49	67.	Munjawadi	25
27	Nandal	51	V.	**BARAD CIRCLE**	
28	Mulikwadi	82	68..	Barad	67
29	Ghadgemala	61	69.	Nimbalak	28
30	Survadi	39	70	Mathachiwadi	27
31	Kharadewadi	40	71.	Pimparad	31
32	Fadatarwadi	10	72.	Takalewadi	29
33	Bhilkatti	37	73.	Rajuri	68
34	Jinti	9	74.	Kurwali	69
III .	**PHALTAN**		75.	Jawali	116
35	Dhuldeo	34	76.	Andrud	117
36	Algundewadi	33	77.	Shereshindewadi	66
37	Khunte	11	78.	Naikbomwadi	65
38	Shindewadi	66	79.	Vadale	64
39	Somanthadi	13	80.	Sonawadi Bk.	61
40	Kambleshar	12	81.	Sonawadi Kh.	62

Sr. No.	Revenue Circle & Village Name	Village code	Sr.No	Revenue Circle & Village Name	Village code
82.	Dudhebavi	71	100.	Vinchurni	76
83.	Tirakwadi	63	101.	Upalve	111
VI.	**GIRVI**	-	102.	Tardap	109
84.	Girvi	114	103.	Veloshi	110
85.	Dhumalwadi	115	104.	Bodakewadi	113
86.	Tathawada	108	106	Adarki Kh.	94
87..	Manewadi	104	107.	Kapshi	84
88.	Zadakbaichiwadi	103	108.	Aljapur	96
89.	Dhaval	101	109.	Hingangaon	91
90.	Pirachiwadi	102	110.	Sherechiwadi	93
91.	Kurwadi Kh.	77	111.	Bibi	83
92.	Tawadi	78	112.	Ghadgewadi	100
93.	Dalawadi	107	113.	Vadgaon	99
94.	Mirewadi	106	114.	Waghoshi	98
95.	Mandavkhadak	112	115.	Korhale	97
96.	Saskal	74	116.	Mirgaon	53
97.	Bhadali Kh.	72	117.	Khadaki	80
98.	Bhadali Bk.	73			
99.	Nirgudi	75			
Source : Tahsil office, Phaltan					

spurs and valleys, which have occupied 413.18 sq.km. (35%) area. Level plain, an extensive zone with 649.28 sq.km. (55%) area is mainly confined to the northern border, parallel to Nira river. It has been widened towards the east having fertile soil cover and has availability of perrinnial water supply from right bank canal. This region falls in rainshadow region, having annual average rainfall of 460mm. The average low temperature (10° C) has recorded in winter season (December), and high temperature (40° C) in summer season (April).

1.6 REVIEW OF LITERATURE

Being an interdisciplinary topic, Irrigation engineers, Agronomist, Economist, Sociologist, Environmental scientist, Administrators and Policy makers have studied the various angle of the theme relevant to them.

Agrawal (1997), the founder of the center for science and environment, spearheaded the *'Jal Swaraj'* campaign. Agrawal (1997) conceptualized and edited Dying wisdom, that explore the tremendous potential of India's traditional water harvesting systems and making water everybody's business, that document's technologies that are being practiced even today by communities in various parts of the country.

The Goa state land use board (2004) has released the second edition of *"GOA SLUB NEWS"*. This issue focuses on "Water Harvesting" which in the last few years has gained tremendous importance. The need of the hour is to have mandatory provisions to give effect to the need to collect and conserve this resource at an individual and community level for use in the non-monsoon periods.

Bansil (1998) in his book "water management in India" has highlighted the ancient water harvesting system in India, Gurjar & Shukla, (1998) in the book "Water Resources, Environment and The People", stated that the problem of water crisis cannot be solved without

people's participation and efforts should be made to get every citizen involved at the different water conservation schemes. Misra, has written two books on traditional tank management in India and various traditional water harvesting systems in Rajasthan titled in Hindi 'Aaj bhi khare hai talab'(1994) and Rajasthan ki rajat boonde'(1995).

Vyas, has also written two books on the subject –'Economic Geology' (1973) and 'Applied Aspects of Dug Well Hydrologic (1993). He has given a good analysis guiding the policy decisions for promoting rainwater harvesting.

Pawar (2003) has attempted an assessment of watershed development programme at micro level. In addition, many scholars have carried out such other studies, which are region specific.

1.7 ORGANIZATION OF THE WORK

The entire study has been organised into six chapters.

- The first chapter deals with statement of the problem, the study region, objectives, methodology & review of literature.
- The second chapter explains the profile of the region, to understand the basis for rainwater harvesting.
- The third chapter is devoted to explain the concept of rainwater harvesting & assessing the present situation of water harvesting.
- Chapter four deals with the assessment of water harvesting at micro level.
- The fifth chapter analyses the potentiality of rainwater harvesting.
- The last chapter deals with findings and recommendations.

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CHAPTER - II

PROFILE OF THE REGION