Water Resource Management Studies of Malhargad Watershed: A Case Study of Purandar Region of Pune District

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Abstract - *Malhargad watershed comes in the jurisdiction of kalewadi village which is small settlement in the purandar tehsil of pune district. Since the location of the watershed area is just above the Dive ghat hill ranges of sahyadri's , the area is facing shortage of rainfall therefore it is considered under a severe, chronic droughtful areas of the district. Resulting, the villagers are facing acute problems of drinking, domestic and irrigation water. By keeping these view in mind and to minimize the discussed problem the water resource management study where carried out in this area to stop soil erosion and to increase the water recharge condition on the basis of these study of the ridge to basin area. Also water budgeting study is carried out with help of existing as well as proposed water conservation structure. The village watershed is an ideal leaf shaped basin which covers 4.1 km^2 areas. Since the village covers large area, therefore for the sake of systematic watershed studies, it has been divided into eight micro watersheds.*

***Key Words*: Watershed Management, Ground Water Recharge, Water Budgeting, Leaf shaped basin**

1.   INTRODUCTION

Now a day's water scarcity is the major problem in Maharashtra. Hence to overcome the droughtful situation watershed management activities are necessary. Watershed is nothing but the drainage basin or catchment area in which water is flowing through a common outlet. A watershed may be nearly flat or may include hillocks, hills or mountains each and every water and land area is a part of one watershed or the other. In watershed, soil as well as water conservation structures plays very important role. Water conservation can be achieved through vegetative and engineering measures. Commonly, watershed development includes treatment of lands .Watershed also maintain the balance of the eco system. Water conservation structures includes check dams, check weirs, percolation tanks, Absorption tank and soil conservation structures such as gully plugs, stone bunds helps in ground water recharge. By knowing the importance of this, in the present condition, water resource management studies of malhargad watershed has been carried out for the sake of detailed investigation. Malhargad watershed comes in the jurisdiction of kalewadi village which is small settlement in the purandar tehsil of pune district. The

Malhargad watershed is divided into eight micro watersheds which is leaf shaped type. In which, water budgeting calculation of water which required for villagers for drinking, domestic and irrigation purposes are carried out.
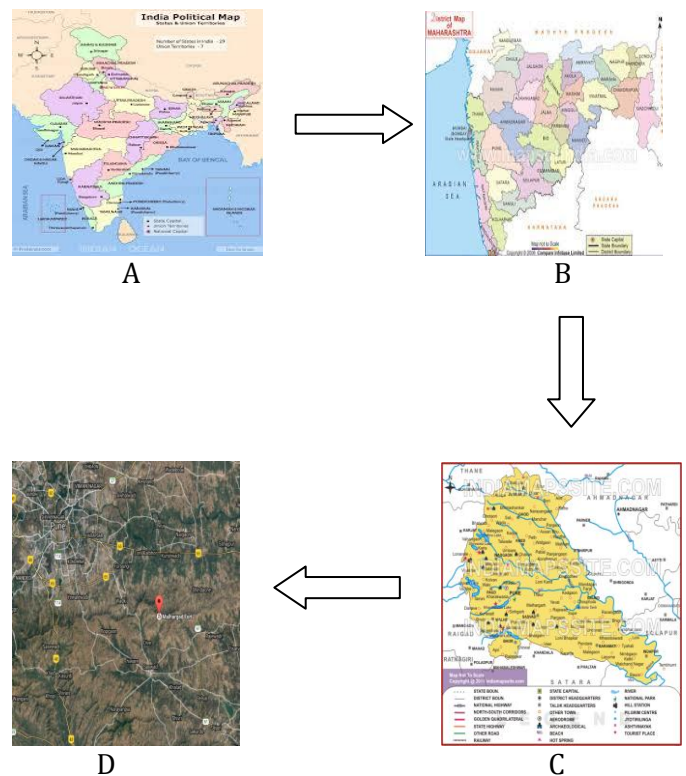

A

B

C

D

Fig.1:- Location map of the study area on regional scale

2. STUDY AREA

The study area for the project is located in purandar taluka, pune district of Maharashtra state. The watershed area is just above the Dive Ghat hill ranges of sahyadri's this area lies in between in 18.4121^{0}N, and 74.04950E. It is about 30 km from pune. And 183 km from Mumbai. The elevation is 954 m. The inhabitants of malhargad watershed depend on agriculture for their livelihood. The area of watershed is 410 Ha.
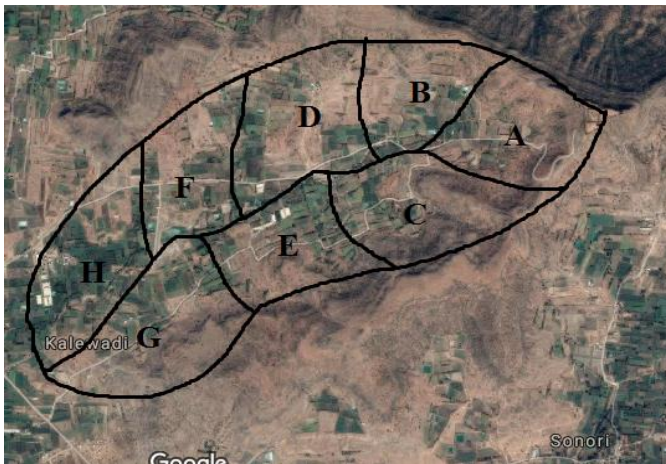
Fig.2:- Detailed map of the watershed

3. OBJECTIVES

1. To prevent soil erosion.
2. To increase infiltration of rainwater.
3. To enhance the groundwater recharge.
4. Afforestation.
5. To maintain balance of ecosystem.
6. To study of requirement of water.

4. METHODOLOGY

4.1 Toposheet: - A Toposheet is a shortened name for 'Topographic sheet'. They essentially contain information about an area like roads, railways, settlements, canals, rivers, electric poles, post offices etc. According to their usage, they may be available at different scales (e.g. 1:25000, 1: 50000).

4.2 Available literature: - A literature review is a search and evaluation of the available literature in your given subject or chosen topic area. It documents the state of the art with respect to the subject or topic you are writing about.

4.3 Geology: - Geology is an earth science concerned with the solid Earth, the rocks of which it is composed, and the processes by which they change over time. Geology can also refer generally to the study of the solid features of any terrestrial planet.

4.4Well Inventory: - The two main activities of the Well Surveillance Program is well surveys and sampling. The two essential activities performed when completing a well survey are locating facilities (i.e. service stations) and then sampling nearby drinking water wells for the appropriate chemical.

4.5 Socio economic survey: - In order to understand the present position of malhargad village in regard to various human social and Infrastructural aspects, a baseline survey based on questionnaire we will carry.

5. EXPERIMENTAL WORK
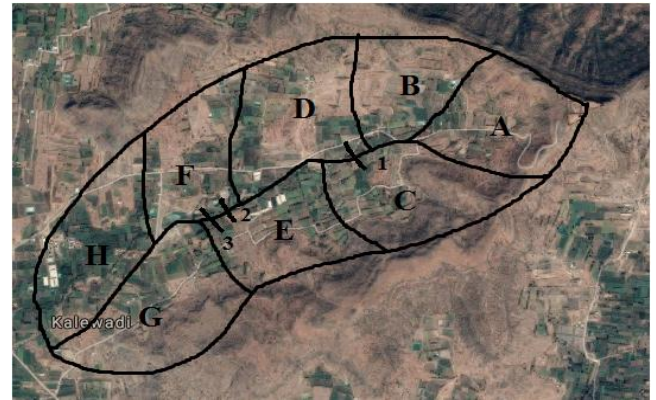## 5.1 COST ESTIMATE OF PROPOSED STRUCTURES

Fig.3:-Detailed location of proposed structures in watershed

5.1.1 CHECK DAM NO.1:-

MEASUREMENT SHEET:-

Sr No	Name of Item	L	B	D	Quantity
1.	Excavation for foundation	38	3.75	3	12.09 M^3
2.	Quantity of concreting	38	3	10	32.26M^3
3.	Steel Reinforcement Assume 1% of concrete.				0.322T

ABSTRACT SHEET:-

Item NO	Description of item	Rate	Quantities	AMOUNT
1.	Excavation for foundation	175	12.09	2115.75
2.	Concreting(M 20)	4895	32.26	157912.7
3.	Steel Reinforcement	35,500	0.322	11431

Total estimated amount for check dam no.1= Rs.1,71,459.45/-

5.1.2. CHECK DAM NO.2:-
MEASUREMENT SHEET:-

Sr.No	Name of Item	L	B	D	Quantity
1.	Excavation for foundation	40	3.75	3	12.73 M^3
2.	Quantity of concreting	40	3	10	33.96M^3
3.	Steel Reinforcement Assume 1% of concrete.				0.3396T

ABSTRACT SHEET:-

Item NO	Description of item	Rate	Quantities	AMOUNT
1.	Excavation for foundation	175	12.73	2227.75
2.	Concreting(M 20)	4895	33.96	166234.2
3.	Steel Reinforcement	35,500	0.3396	12055.8

Total estimated amount for check dam no.2=
Rs. 1, 80,517.7/-

5.1.3 CHECK WEIR
MEASUREMENT SHEET:-

Sr.No	Name of Item	L	B	D	Quantity
1.	Excavation for foundation	25	2.05	3	5.30 M^3
2.	Quantity of concreting	25	2.25	8	12.47M^3
3.	Steel Reinforcement Assume 1% of concrete.				0.124T

ABSTRACT SHEET:-

Item NO	Description of item	Rate	Quantities	AMOUNT
1.	Excavation for foundation	175	5.30	927.5
2.	Concreting	4895	12.47	61040.65
3.	Steel Reinforcement	35,500	0.124	4402

Total estimated cost for check weir = Rs.66,370.15/-

5.1.4. Gabion:-
MEASUREMENT SHEET:-

Sr. No	Name of Item	L	B	D	Quantity
1.	Quantity of stone work	45	1.64	10	20.88 M^3

ABSTRACT SHEET:-

Item NO	Description of item	Rate	Quantities	AMOUNT
1.	Lifting of stone from(10m-30m)	L.S		5000
2.	Stone work	1600	20.88	33408

Total estimated amount for Gabion = Rs.38408/-
Grand Total= 4, 56,755.3
Contigencies@5%= 22837.7
Water supply@5%= 22837.7
The Total cost of all above proposed structures= Rs.5,02,430.83/-
By assuming 20% cost for maintaining existing structures in the watershed Rs. 1,00,486.16/- is required for maintaining existing structures.

6. RESULTS
6.1 Testing of soil sample
6.1.1 Permeability Test
A) Falling Head Method

Bottom sample results:-

Trial	Head Changes	Time	K(cm/sec)
1.	88-78	2.58	5.16x10^{-4}
2.	-	2.59	5.14x10^{-4}
3.	-	3.01	4.42x10^{-4}

Average permeability K= 4.90X10^{-4} cm/sec
Intermediate sample result:-

Trial	Head Changes	Time	K(cm/sec)
1.	88-78	1.26	1.05x10^{-4}
2.	-	2.4	5.55x10^{-4}
3.	-	1.58	8.43x10^{-4}

Average permeability K=8.18X10^{-4} cm/sec
Top sample:-

Trial	Head Changes	Time	K(cm/sec)
1.	88-68	14.21	0.0120
2.	-	14.20	0.0120
3.	-	13.83	0.0123
	-	13.89	0.0122

Average permeability K=0.0121 cm/sec

B) CONSTANT HEADS METHOD:-

Top sample result:-

Trial	Time(sec)	Q(ml)	K(cm/sec)
1.	30	91	3.55×10^{-3}
2.	-	91	3.55×10^{-3}
3.	-	91	3.47×10^{-3}

Average permeability K=3.52×10^{-3} cm/sec

Intermediate sample result:-

Trial	Time(sec)	Q(ml)	K(cm/sec)
1.	30	8	3.12×10^{-4}
2.	-	8	3.12×10^{-4}
3.	-	8	3.12×10^{-4}

Average permeability K=3.12×10^{-4} cm/sec

Bottom sample results:-

Trial	Time(sec)	Q(ml)	K(cm/sec)
1.	30	5	1.95×10^{-4}
2.	-	5	1.95×10^{-4}
3.	-	5	1.95×10^{-4}

Average permeability K=1.95×10^{-4} cm/sec

6.2 Water sample testing:-
6.2.1 Alkalinity Test:-

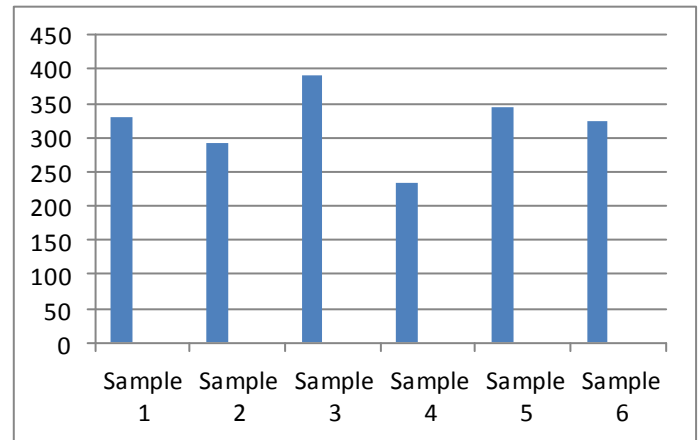| Sample no	phenolphthalein	Methyl orange	Result (mg/l)
1	0	8.1	162
2	2	7.7	15
3	0	9.4	188
4	1.2	6.6	132
5	0	9.8	196
6	0	9.6	192

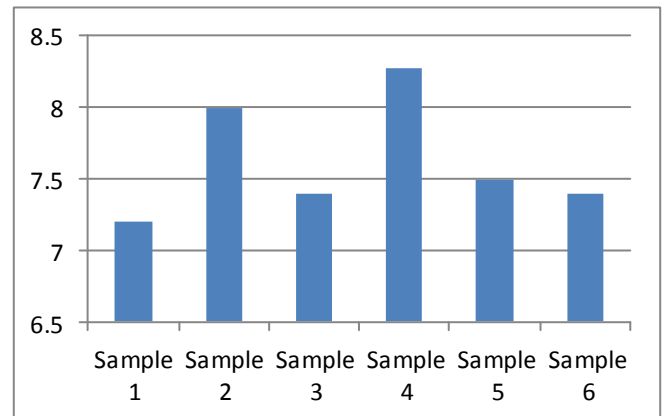## 6.2.2 Chloride Test:-
Results in (mg/l)
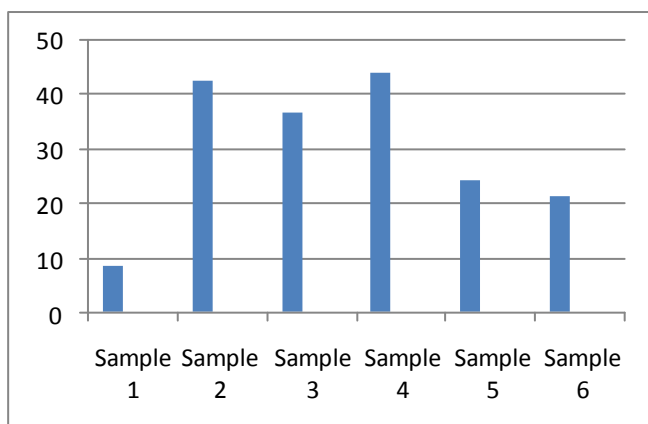
6.2.3 Hardness Test:-
Results in (mg/l)

6.2.4 Ph Result:-

3. CONCLUSIONS

The aim of this project is to emphasize the importance of the water conservation and soil conservation in malhargad watershed. There has been a significant increase in the water availability for irrigation and livestock. There is a change in cropping pattern in and an increase in the yield of crops cultivated in the region after the implementation of the project. If watershed development project implemented then it will result in improving the living standard and economic condition of the people in malhargad watershed. Most important is the drought in this area will overcome through this project. For successful implementation of this project participation of local people, government officers and funding agencies is must.

ACKNOWLEDGEMENT

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