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Watershed Management for Dafalapur Catchment

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***Abstract*: In India annual rainfall differ in various regions. In some region Rainfall is sufficient to fulfill water demand of that region but in some region or areas Monsoon Rainfall don't even satisfy the domestic demand, therefore other demand like irrigational demand, industrial demand not even stand a chance to get satisfied by average rainfall of that region. The water shortage leads to various socio- economic problems related to their daily live. Also because of lack of knowledge at village levels causes the water scarcity. So we present the participatory watershed management in Dafalpur village, in Jath Taluka, Sangali district. Watershed development techniques like rain water harvesting, vanrai bandhara, farm pond etc. are suggested to make the village self-sufficient in case of water demand.**

***Keywords*: Watershed management, Water budget, Kharif, Rabbi, Rain water harvesting.**

1. Introduction

In India, more than half of the population still depends on agriculture for their green revolution has been limited to the areas with irrigated resources. Despites huge investments and major irrigated projects, only 35% of total cultivated land is

Against this backdrop, watershed management has emerged as a viable alternative for integrated management of resources to optimize the potential of rain fed areas facilitating improved agricultural productivity leading to poverty alleviation food security, environmental protection, access to safe energy and drinking water facility as well.

Water scarcity involves water stress, water shortage or deficits and water crisis. This may be due to both nature and human's main factors that contribute to this issue include poor management of resources, lack of government attention and manmade waste.

2. Definition of Watershed Management

SCSA Soil Conservation Society of America (1982): Watershed management is the integrated utilization, regulation and care of the water and land resource in a watershed with the aim of meeting predefined development goals.

FAO (1987): watershed management is the process of developing and implementing a series of actions for the management of natural, agricultural, and human recourses within a watershed to provide required and appropriate goods and services to society under the per condition that land and water resources are not negatively affected. Watershed management needs to consider the prevailing socio- economic and institutional factors, within and beyond the watershed.

All India Soil and Land Use Survey (AISLUS, India, 1988): watershed management is the coherent development and utilization of the land and water resources within the natural boundaries of a watershed to deliver and produce in a sustainable manner from plant, animals and their products, while ensuring a controlled and clean inflow of water into downstream communities.

AFFRO Action for Food Production (INDIA, 1988):

Watershed management is the attempt to utilize the available natural resource in a watershed through a process of technological and human development within one integrated programmers in an optimal manner, in order to improve the living standards of the local communities.

3. Objectives of Watershed Management

- To ensure that beneficial uses of water resources and other related resources are sustained.
- To achieve specified and agreed management targets for water and related resources.
- To ensure the avoidance of negative off-site impacts (externalities) on water and related resources.
- To appropriately manage other resources that impact on water, such as land.
- To promote social and economic development.
- To ensure maintenance of biodiversity.
- To conserve, minimize the degradation of, or rehabitate resources and the environment.
- To control damaging runoff and degradation and there by conservation of soil.
- To manage and utilize the runoff water for useful purpose.
- To check soil erosion and to reduce effect of sediment yield on the watershed.
- To moderate the flood peaks at downstream areas.
- To increase infiltration of rainwater.
- To enhance the groundwater recharge whenever

applicable.

- To protect the conserve and improve the load of watershed for more efficient and sustained production.

4. Methodology

Phase 1

1. Collection of data for various methods of ground water recharge.
2. Study of various methods.
3. Collection of data related to various case studies.
4. Selection of case study.
5. Visit to actual site.

Phase 2

1. Collection of topographical, geological, metrological data.
2. Study of data collection.
3. Interview of common people.
4. Calculation of water budget.
5. Calculation of rain water harvesting structures.
6. Calculation of water available from various structures.

5. Water Budget

The project area situated in Jat taluka, district Sangali, Maharashtra state. The total area of Dafalapur is 4543.07 ha. The most of project area lies under draught. Average rainfall of the village is 362.3 mm.

Name of the village = Dafalapur		
Available water from rainfall		
Total area	Rainfall (mm)	Available water (m^3) (4543.07 X 362.3/100)X1000
4543.07	362.3	16459.543 X 10^3

Water required for daily purposes				
Name	**No**	**Daily requirement**	**days**	**Annual water requirement per year**
People	12000	0.135	365	591.3 X 10^3
Animal	5000	0.050	365	91.25 X 10^3
Sheep & goat	2500	0.007	365	6.387 X 10^3
Kukkut palan	400	0.002	365	292
Use of public place	100	0.1	365	3650
Total				699.266 X 10^3

A	**The total water required for crops during the kharif season**	5.3.1 (full need) + 5.3.2(full demand) +5.3.3 (1/2 need) +5.3.4 (1/3 need) = 3068.25X 10^3 +202X 10^3+(1/2 of 135X 10^3)+(1/3 of 3280.02 X 10^3) **=4420.16X 10^3**
B	**Extra need of water require for crops in kharif season**	5.3.3(1/2 need)+ 5.3.4(2/3 need) =(1/2 of 135X 10^3)+(2/3 of 3280.02 X 10^3) **=2265.11 X 10^3**

Kharif season

Water required for crop in kharif season				
Name of crop	**Total area (ha.)**	**Area irrigated by canal**	**Water required for per ha.**	**Total required water for crops**
	1	2	3	4=2 X 3
Bajari	480	480	3250	1560X 10^3
Sweetcorn	292	292	4500	1314X 10^3
Mug	11	11	3000	33X 10^3
Udid	21	21	3250	3.25X 10^3
Waternut	18	18	5000	90X 10^3
Grass	17	17	4000	68X 10^3
Total				3068.25X 10^3
Vegetable crops in kharif season				
Onion	10	10	5500	55X 10^3
Chilly	10	10	8500	85X 10^3
Brinjal	4	4	8000	32X 10^3
other	5	5	6000	30X 10^3
Total				202X 10^3
Two season crops				
Cotton	10	10	7.5 X 10^3	75 X 10^3
Turmeric	5	5	7.5 X 10^3	60 X 10^3
Total				135X 10^3

Annual crops							
Name of crop	**Area irrigated by canal**	**Water required per haX10^3**	**Water req X10^3**	**Area irrigated by drip**	**Water required per ha. X10^3**	**Water requireX10^3**	**Total required waterX10^3**
1	2	3	4=2x3	5	6	7=5x6	8=4+7
Sugarcane	47.5	20	950	18.4	12	220.8	1170.8
Groundnut	2.20	12	26.4	3.20	7.2	23.04	49.44
Mango	3	14	42	-	-	-	42
Grapes	-	-	-	185	10.2	1887	1887
Banana	4.60	19	87.4	1.70	11.4	19.38	106.78
Other	2	12	24				24
Total							3280.02

Water required in Rabbi season				
Total crops in Rabbi season				
Name of crop	Total area (ha.)	Area irrigated by canal	Water required for per ha.	Total required water for crops X 10^3
	1	2	3	4=2 X 3
Onion	1325	11325	4500	5960.5
Tomato	60	60	3500	210
Brinjal	99	99	5250	519.75
Chilli	292	292	3500	1022
Etc	5	5	8000	40
Total				7754.25
The vegetable crops in Rabbi				
Total	29	29	7500	271.5
Annual crops				
Groundnut	2	2	6500	13
Foodercrops	1	1	8000	8
Total				21

Water required in Rabbi season				
Total crops in Rabbi season				
Name of crop	Total area (ha.)	Area irrigated by canal	Water required for per ha.	Total required water for crops (X 10^3)
	1	2	3	4=2 X 3
Onion	1325	11325	4500	5960.5
Tomato	60	60	3500	210
Brinjal	99	99	5250	519.75
Chilli	292	292	3500	1022
Etc	5	5	8000	40
Total				7754.25
Vegetable crops in Rabbi				
Total	29	29	7500	271.5
Annual crops				
Groundnut	2	2	6500	13
Foodercrops	1	1	8000	8
Total				21

C	**Total water requirement for rabbi summer crops**	5.8.1+5.8.2+5.8.3 =7754.25X10^3+217. 5X10^3+21 x 10^3 = **7992.75X 10^3 M^3**
D	**The need of water for the total crops**	A+B+C **4420.16X 10^3 +2265.11 X 10^3+7992.75X10^3 =14678.02X10^3 M^3**
E	**Total water required for the village**	5.2+D **699.266X10^3+14678.02X10^3 =15377.268 X10^3 M^3**

Evaporation of water from non-agricultural land				
Sr.no	Type of land	Area (Ha)	Water evaporation (mm)	Total evaporation X10^3
1	2	3	4	3X4
1	Scapled land	44	50	2200
2	Meadow	60	200	120
Total				2320

Runoff water from surface is considered as 25% of water available from rain = 4114.87X10^3 M^3

Total available water

= water available from rainfall – losses due to evaporation – losses due to surface water

=16459.543X10^3- 2320 X10^3 - 4114.87X10^3

Total available water = 10024.673X10^3 M^3

Need of extra water required

= Required water - available water-water stored by slope

= 15377.268 X10^3 – 10024.673X10^3

Need of extra water required = 5352.595 X10^3 M^3

6. Water storage

A. Water stored by reservoir

Total area of reservoir = 52 ha

Water storing capacity of reservoir per ha = 10000 M^3

Water stored by reservoir = 52X10000

= 520000 M^3

Water stored by reservoir = 520X10^3 M^3

B. Calculation of water store by rain water harvesting

We considered the all government structures in Dafalapur village for rain water harvesting.

Grampanchayt:

Total area of Grampantchayt = 279.978 M^2

The average rainfall = 0.3623 M

Water stored by rainfall = Area X Rainfall

= 279.978X0.3623

= 101.436 M^3

Chavdi:

Total area of Chavdi = 42.63 M^2

The average rainfall = 0.3623 M

Water stored by rainfall = Area X Rain

= 42.63 X 0.3623

= 15.448 M^3

Gaon kamgar talathi office:

Total area of gaon kamgar talathi office = 71.361 M^2

The average rainfall = 0.3623 M

Water stored by rainfall = Area X Rainfall

= 71.361 X 0.3623

= 25.854 M^3

School building:

Total area of School building = 863.1422M^2

The average rainfall = 0.3623 M

Water stored by rainfall = Area X Rainfall

= 863.1422 X 0.3623

= 312.716 M^3

Girls school:

Total area of School building = 3648.24 M^2

The average rainfall = 0.3623 M

Water stored by rainfall = Area X Rainfall

=3648.24 X 0.3623

= 1321.775 m^3

Total water stored by Rain Warer Harvesting =1777.229 M^3

After considering all losses

Evaporation + First wash + Shifting due to wind + Pits in

gutter = 25%

The 25% losses is 443.303 M^3

Total water stored by Rain Water Harvesting

= 1777.229 – 444.307

= 1332.922 M^3

C. Water available from slope by other village

Water available from slope			
Catchment type	**Area**	**Slope per ha.**	**Total slope X 10^3**
Declaration less than 5%	5016	483.5	2425.24
Declaration between 5 to 20%	370	726.3	268.73
Declaration less than 20%	107	367.1	103.497
Total			**2797.447**

D. Water stored by structures

Total water stored by different structures is 852 $X10^3$ M^3

E. Calculation

1. Total water required - 15377.268 $X10^3$ M^3
2. Total available water = 10024.673$X10^3$ M^3
3. Need of extra water required = 5352.595 $X10^3$ M^3
4. Water stored by reservoir = 520$X10^3$ M^3
5. Total water stored by rain water harvesting =1332.922 M^3
6. Water available from slope by other village= 2797.447 $X10^3$ M^3
7. Water stored by structures=852 X 10^3 m^3

Total water stored =5502.369 X 10^3 M^3

In that way water requirement of Dafalapur village is successfully fulfilled.

7. Conclusion

In Dafalapur village after the rainy season around month of December the water scarcity starts in most of the hamlets compromising and water demand increases.

Total water required for Dafalapur village is 15377.268 X 10^3 M^3.and water required to store is 5352.595 $X10^3$ M^3. Then total water stored by rain water harvesting, by various structures, by slopes, by reservoir is 5502.369 X 10^3 M^3. In that way total water requirement for Dafalapur village is fulfilled.

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