

SURFACE WATER RESOURCE EXPLORATION AND ENHANCEMENT – AN OPINION SURVEY OF SATHIYAR MICRO WATERSHEDS IN SIRUMALAI HILL IN ALANGANALLUR BLOCK, MADURAI, TAMIL NADU.

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Abstract

A watershed is a special entity of the environment and it can be distinguished with slope variations and water catchment. The rainfall runoff water drains through tributaries, stream, river and channel to the particular collecting point which is known as watershed. Water resources can be classified as various hydrological units like basin, catchment, sub catchment, watershed, sub watershed and micro watershed according to the area covered by them. It is having a maximum limit of 1000ha or 10 sq km areal extent. This study tries to survey the status of surface water exploration and the measures of enhancement of the surface water in the study area of Sirumalai hill in Alanganallur block, Madurai, Tamil Nadu. The primary data were collected by administering questionnaires among the farmers to know the actual status of availability and usage of surface water in the study area. 80% agricultural land is depending upon surface water for irrigation in the study area of Sirumalai Hill environs of Sathiyar reservoir catchment and ayacut area. From the year 2011, digging of bore well and open well are completely banned by the government of Tamil Nadu in Sirumalai Hill. This led to the people for using the surface water for their all activities except for drinking purpose. The surface water resources are getting water from the rainfall, melting snow and from aquifer leakage. In this study, the existing source of the surface water, its availability and utilisation of water are investigated through the questionnaires which were administered to the farmer community of local study area. This survey revealed the major challenges of water scarcity due to improper maintenance of drainage system which will affect the storage of surface water and ground water level in future and the potential to support needed for the farmers through watershed management of the Sathiyar River and Sathiyar reservoir.

Keywords: Surface Water, Catchment, Micro watershed, Drainage system, Ayacut, Agriculture, Farmers' Opinion Questionnaire (FOQ).

INTRODUCTION

The agricultural productivity and yield of the Sathiyar river sub basin has been decreased due to water scarcity which is caused by rapid increase in population, growing standards of living and rapid improvement of industrialisation and urbanisation. The availability of water in the water resources across the Sathiyar river sub basin is reduced for a long time. In order to find out the availability and requirement of water for many other purposes like agricultural, domestic, small industries, fisheries etc., this study has been carried out. To identify the opinion of the people of the study area about the availability and requirement of water, questionnaires were administered to them and their opinions were collected and analyzed. This study reveals that there is no industrial activity in the study area. Most of the agricultural fields are being converted into residential areas and human settlements and poultry farms are created. According to the opinion of the people of the study area, two types of water resources are needed in this area. The slope cultivation farmers of the uphill of the Sirumalai are opined that the construction of a storage system like a check dam across the stream line is needed to store the rainfall runoff water in which the water can be persevered for the post-monsoon period. The ayacut area of the study area is higher than the water holding capacity of the Sathiyar reservoir, this water is not used to irrigate the agriculture land throughout the year. For this reason, the flat terrain cultivators of the foot hill region need water storage system like small tanks in addition with Sathiyar reservoir and also need a canal construction for a new connection from the PMC (Periyar Main Canal) to Sathiyar reservoir. Hydrology and other natural sciences of geology, geomorphology, geochemistry and etc., are the social sciences that give clear direction about the development of water resource for society (Rajaram Harihar et al 2015).

STUDY AREA

Study area of Sathiyar sub basin is segmented by micro watersheds and especially the Satti Ar river catchment and ayacut area of Sathiyar reservoir within the Alanganallur Block, Madurai district in Tamil Nadu. The areal extent of the study area is covered from 78°7'25.957"E 10°0'6.07"N to 77°59'1.873"E 10°14'44.826"N. Totally 29 numbers of Micro watersheds are presented with areal extensions from 1 to 10 square kilometre. 24 micro watersheds are present in the catchment area of Satti Ar river valley region and distribute the water into Sathiyar reservoir; remaining 4 micro watersheds are present in the lower part of Sathiyar reservoir and this area is fully depending on the surface water source from Sathiyar reservoir. Its catchment area is 35.41 Sq. Miles, water spread area is 3.61 Sq.Miles, capacity at Full Reservoir Level (FRL) is 56.00 Mcft (Million Cubic Feet) and Maximum Flood Discharge is 9705 C\S (Cusecs per Second).

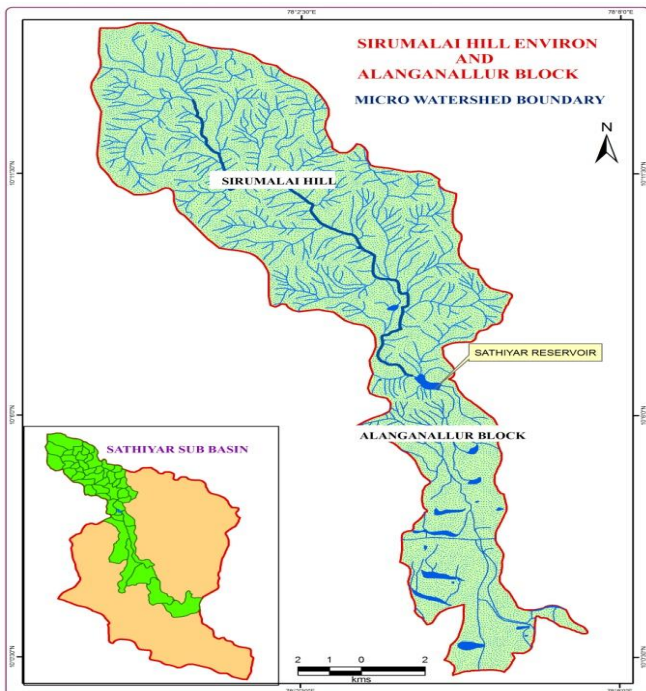
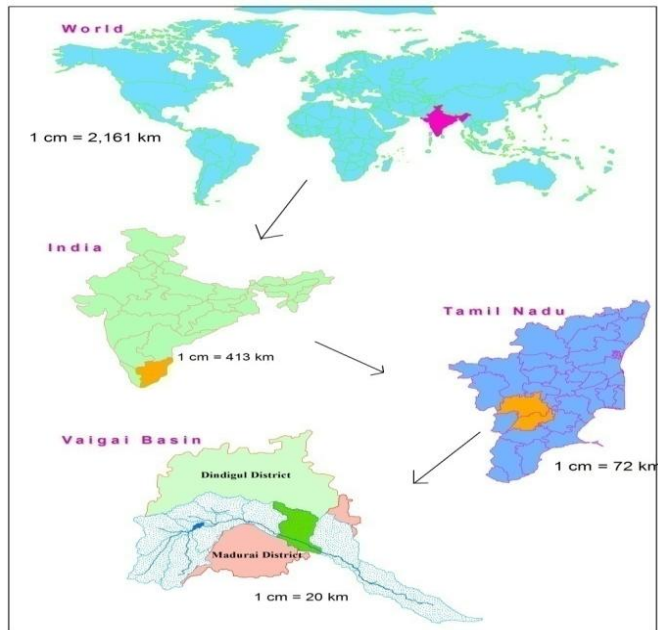
The aims and objective of this questionnaire

- To collect the opinion of the farmers about the status of water resources in study area
- To assess the vulnerability of agricultural growth and surface water availability in this region
- To suggest the standard remedial measures to reduce the water scarcity in this area

MATERIAL AND METHODS

The questionnaire was prepared to find the surface water resources availability and adequate amount of water utilised for agriculture, domestic, ground water research and etc. The validity of the questionnaire had been verified administering the questionnaire

to the experts and the corrections were made as per their opinion. Then the questionnaires were administered to 50 farmers and their opinions were collected and recorded in the questionnaires. An interview was also carried out to capture the thoughts of the farmers related to the present day agriculture and the hazards they are realizing. The Farmers' Opinion Questionnaire (FOQ) which was administered to the farmers contains 28 questions. Each and every respondent is having more than 10 years of field experience by utilizing the water for their agricultural activities. Each question is structured in order to collect basic information about water utilisation of agricultural and domestic activities of the respondent. The purpose of questionnaire data collection is to focus on how the government research is concerning future impacts of climate change on agriculture's use of water resources, flood and drought management (OECD 2010).



Fig(1) Location map of the Study Area

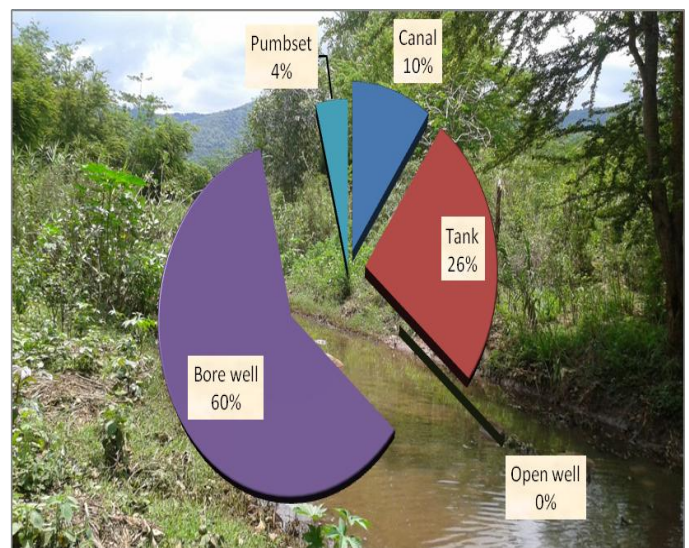
RESULT AND DISCUSSION

The field survey was carried out in a friendly manner through a face-to-face interaction. This survey enabled the researchers to identify the personal attitude of the farmers and their feelings about water scarcity. The field survey has revealed that more than 80% of the people are depending upon the agricultural labour work under landlords in the uphill of Sirumalai. But in the low hill side, more than 80% people are land holders and are doing agricultural activities in their own lands in the micro watershed area of Sathiyar sub basin which is situated in the Alanganallur block.

Source and type of Irrigation

Many types of irrigation such as canal, tank, open well, bore well, pump set and lift irrigation are being practiced the farmers in the study area according to the seasonal changes. Runoff is usually not a problem for irrigation systems installed in fields with low slopes and coarse soils with high infiltration rates (ENCON2.4. 2012). If rain fall fails in top of the Sirumalai hill, then the farmers collect the water from the open wells by using oil engine (pump set) motor. Since the water from wells is insufficient, the agricultural yield is poor. Due to fixed time table of water supply from the water resource by the Government, the farmers receive water depending on their registered lands, but the volume of water should be varied by the size of the land (Roerink G. J. et al 1997).

Figure 2 shows the four types of irrigation sources used by the farmers specifically in downstream side of Sirumalai foot hill region. 60% and 4% of the farmers are using bore well and pump set irrigation system respectively for field crop (Kharif Rabi, Maize, Sorghum, Paddy, Pulses, Groundnut and etc). 26% and 10% of farmers are using tank and canal water irrigation system respectively for flower crops (Arali, Jasmine, Chevanthi, Rose, Pichi, Crossandra, Mullai and Champangiin), fodder crops (Sorghum, Feeder grass), Horticulture crops (Mango, Banana, Citrus, Sapota, Guava and custard apple) and Vegetables (Onion, beans, Potato, Tomato, Drumstick). Since the ground water level of the study area has been drastically reduced, there is no open well irrigation system available. The exhaustion of ground water table will make a major problem in irrigation system (Brajesh Jha et al 2009).

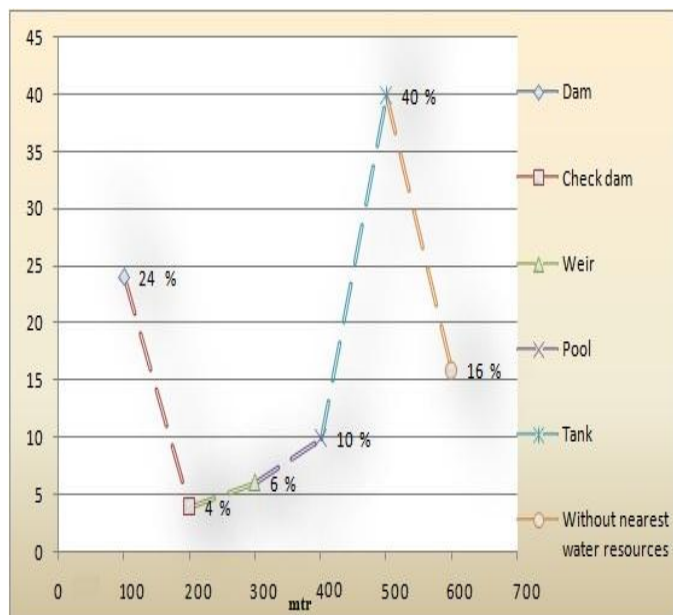


Fig(2) Source of Irrigation utilised by the farmers (in percentage)

Distance between the cultivated land and source of water:

Major problem of the irrigation system is the distance between the source of water and irrigation land. When water is passing

through the open supply channel it will be lost by evaporation and absorption during the runoff flow. If the farmer makes an alternative way to collect the water through temporary pipe line method, then it will take more time and loss of excess of water. From the analysis, 24% of the farmers who are within 100 to 200 meter distance from the water source, can use the surface water from the dam. If a check dam is constructed within 200 – 300 meters, 4 % of farmers will get water. 6 % of farmers who are within 300 - 400 meters can collect water from weir area. Sometimes few farmers make a small pool inside the cultivated land to collect and store rainfall water for summer time of water deficiency. 10% farmers who live nearly 400 meters away from the water resources can follow this pool water storage method. Tank irrigation system is followed by the all farmers throughout entire Tamil Nadu. But in the study area, only 40% people use the water from the tank because the tank irrigated lands are located at 400 to 500 meter distance from the water source. 16% of farmers are unable get water from the tank or reservoir or check dam or weir because their lands are placed at more than 500 meter distance from the water resource. The distance and other inconvenient factors highly affect the water supply to the irrigation activities. In the cases of lands located in high altitudes which are located to the nearby water resource also cannot collect water from the source and in this situation, the farmers are using motor engines to suck up the water from the source. Figure 3 shows the percentage of lands with proximity from the water sources.

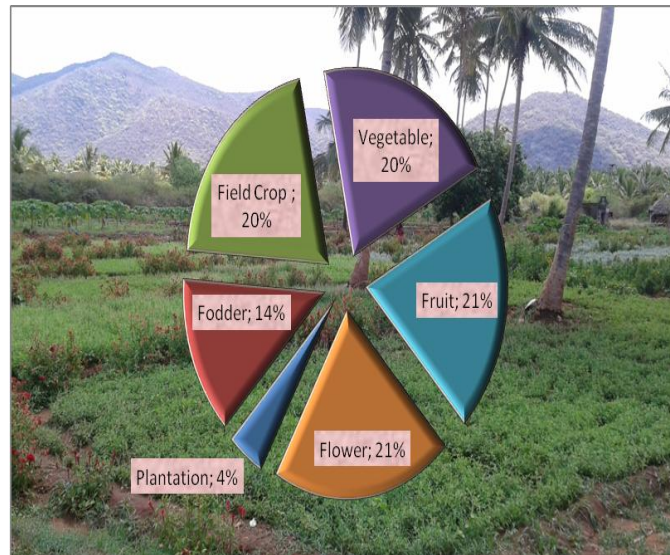


Fig(3) Proximity of water resources

Cultivated crops

The study also revealed the cropping pattern and yield variations based on the water resource availability. Effective water resources management increasingly calls for integration of these technologies with hydrologic modelling (Tim 1996 and Sakthivadivel et al.,1999). According to FAO corporate document repository a certain crop grown in a sunny and hot climate needs per day more water than the same crop grown in a cloudy and cooler climate, some crop are need daily water. In this study, it is identified that 4 % of the lands are being used for growing Plantation crops (Coffee, papaya, banana, Coconut, Teak, Eucalyptus, Casuarina, Elavan or milagu), 14% for fodder crops (Sorghum, Feeder grass), 21 % for flower crops and fruits, 20% of the agricultural land area is being used for growing vegetables and field crops. These are all traditionally followed

cultivation practices. In earlier stages, the climatic conditions were favourable for crop crowing and availability of water was excessive and so the people did not worry about the need of water for all of the irrigation and other requirements. In recent years, climatic conditions and availability of surface water conditions inverted the earlier stage and most of the farmers rely on the bore well irrigation system. Figure 4 shows the percentage of agricultural lands used for various crops.



Fig(4) Types of Crops

Sathiyar reservoir holds the water in full capacity during the monsoon period. At the the same period, small tanks, bore wells and open wells are also holding adequate amount of water for the agricultural activities. During monsoon, there is no need for getting water from the reservoir for all the purposes. But in summer season, there is no water available in all the water resource system including the reservoir. In this condition the small check dam, and additional water storage tank which can be constructed for water preservation system will be more helpful for the farmers to utilise the water during the deficiency period. The field survey and questionnaire collections show that all the uphill farmers (100%) are in need of surface water storage system and they urge for the construction of the check dam in fourth and fifth stream order line. In the foot hill region of the reservoir, all the farmers need water from the PMC (Periyar Main Canal) of Vaigai dam. If the Sathiyar reservoir is connected with the PMC, then the foot hill region farmers will get adequate amount of water even in dry season. These two types of surface water management systems are the best ways of standard remedial measures for retrieving from the water scarcity especially for agricultural activities. More than 45,000 people will be benefited directly if the check dam and the connecting water channel are constructed.

CONCLUSION

The foremost priority at this stage should be given to the surface water management system which is needed for the water resource formation. The farmers are suffering from water scarcity which is leading to poor agricultural yield. Most of the farmers lack interest in agriculture and they wish to change their job from agriculture to other works. Without the construction of the check dam and connecting channel, agriculture will not be sustained in this area. The farmers have felt that it is high time for the Government to do the needed constructions to save the farmers.

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