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Traditional Water Harvesting Systems and Management in Upper Tuirial Watershed, Mizoram.

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ABSTRACT:

Technological advancements have made our lives much easier and have reduced the need for manual labor. Which later developed into overdependence on technology and negligence of viable eco-friendly tapping of our resources. Water resources are crucial for sustainable development and can be managed using both traditional and modern technologies. However, in the studied area, traditional technology is still relied upon despite the high potential for modernization. In the study area, water resources remain largely dependent on traditional methods. This study aims to assess the level of traditional water harvesting systems and their management to alleviate water scarcity during dry seasons.

Keywords: technological, eco-friendly, traditional, resources, management.

1.1. Introduction

Availability of water resources is one of the important factors for nomadic tribes which is more or less the same to migrate villagers in search of new land among the tribal people of Mizoram, in the olden days. The village elders and prominent citizens would go in search of new land for the community thus and when they would consider the availability of water for the community in regard to their security. Thus, every community would prefer a safe site of water source for them. This is their primary source of water. Generally, they prefer where plenty of water sources are available for the community. Nowadays, the water sources are mainly from the government supply which resulted from Many people have become overly dependent on the government's water supply, particularly through PHED.

1.2 Study Area

Upper Tuirial Watershed covers 535 square kilometres, out of which 88.7 percent falls under Aizawl District and 11.3 percent falls under Serchhip District. It extends between 23º51'12'' North to 23º26'12''North latitude and 92º41'51" East to 92º51'46" East longitude. According to the 2011 census, the total population of the study area is 32567. There are 27 villages within and on the catchment area and 6732 households (Census of India, 2011). The prominent physiographic character of the Upper Tuirial Watershed is the presence of medium structural hills ranging between 800m-1200m running north-south direction at the eastern and western watershed boundary. The forest cover type is mainly tropical wet evergreen forest mixed with semi-evergreen and tropical moist deciduous forests comprising mainly bamboo.

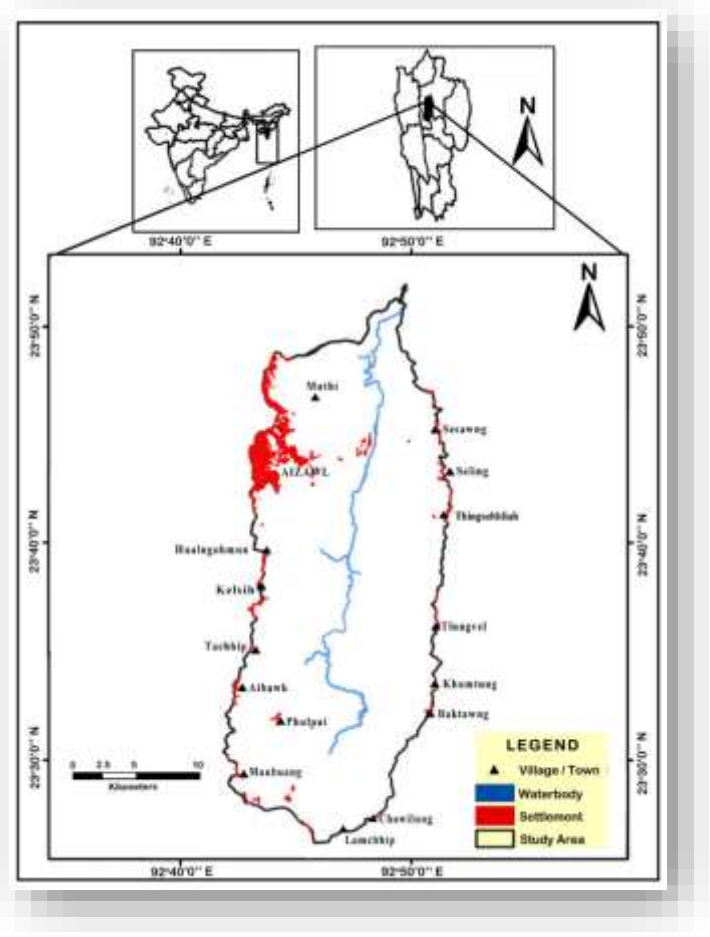

Figure 1: Study Area

1.3 Methodology

The possible traditional water harvesting systems were traced through the collection of primary data and field surveys. Primary data of water sources and water harvesting systems, water conservation practices and management processes are collected from 13 villages 48 % of the total villages). Using a purposive random sampling method, a household-level survey is carried out covering 20 – 25 percent of the total households. The author visits the Village Council President/Secretary of each village and available institutional head to collect reliable information as far as possible. The tool kit consists of household survey, village survey and discussions with village leader. For obtaining household survey, pre-tested questionnaires, semi-structured questionnaires, and informal interviews were also used in order to reach the desired conclusion.

Secondary data like rainfall, humidity, and climatic factors as well as population statistics are also collected from records of concerned departments of the state government.

1.4 Objectives of the Study:

1.4.1. To trace out traditional water harvesting systems.

1.4.2. To assess the management of traditional water harvesting systems.

1.4.3. To suggest measures for the improvement of traditional water harvesting.

1.5. Traditional Water Harvesting

Water Harvesting is done by many tribes in order to sustain life. It has been practiced for over 4,000 years throughout the world. It refers to the technology used to collect, convey, and store rainwater from relatively clean surfaces like the roof, rock catchment, or land surface. This collected rainwater is essentially for later use. Traditionally in arid and semi-arid areas, rainwater harvesting systems have provided water for domestic use, drinking, livestock,

and small irrigation purposes. In India, the traditional water harvesting systems are practiced from rooftop rainwater harvesting, groundwater harvesting through spring sources and seepage conduits as well as from river sources. The methods have different names according to their location and the system applied. Paar in the western Rajasthan region, Talabs in the Bundelkhand region, and Saza Kuva in eastern Rajasthan are the most popular names for water harvesting structures. They are retention ponds that are used to collect surface runoff water from the catchment area. This type of pond typically has a mud bottom and needs to improve the quality of water through natural processes like sedimentation, disinfection, and soil filtration. Johads are small earthen check dams that capture and conserve rainwater, Pat system was devised according to the peculiarities of the terrain to divert water from swift-flowing hill streams into irrigation channels. Guls and Kuls built in the Western Himalayas are simple channels used to divert water for irrigating lands. The level of water availability is diverse in different regions and areas. The uses and demand of water for households and their potential is usually calculated according to the living standard of the inhabitants, regardless of where and how they are located. The areas with higher technologies and urban centers needed more supply of water while the rural areas usually had lower levels of water consumption.

The Traditional Water harvesting systems practiced in the study area are identified in the form of rooftop rainwater harvesting, spring water harvesting, channel or bamboo line water harvesting, catchment area runoff retention ponds, and in the form of fish ponds in farm areas.

Figure 2: Spring Water, Chawilung

1.5.1. Rooftop Rainwater Harvesting

The oldest method of harvesting rainwater is collection from the rooftop. Traditionally water is harvested from the rooftop with the help of a gutter made out of bamboo. They collect rainwater in large pots, which they use meagerly. Animals are not usually fed with collected water. According to the State Meteorological Station, Aizawl, the region received a total of 2015 mm of rainfall during 2022. The practice of rainwater harvesting in the upper Tuirial Watershed is shown in Table 1.

Table 1: Rainwater Harvesting in the Study Area, 2021. Source: Author

Sl. No	Village	Total Household	Surveyed Household	% of Surveyed Household	%of Household RWH practice
1	Seling	547	140	25.5	20
2.	Thingsulthliah	805	200	24.8	30
3.	Phulmawi	70	30	42.8	5
4.	Khumtung	263	80	30.4	30
5.	Baktawng	686	170	24.7	27
6.	Chawilung	120	50	41.6	15
7.	Lamchhip	180	50	27.7	17
8.	Kelsih	220	60	27.2	35
9.	Aibawk	410	100	24.3	37
10.	Thiak	209	60	28.7	10
11.	Hualnghmun	206	60	29.1	42
12.	Muthi	224	60	26.7	50
13.	Sesawng	847	200	23.6	45
	TOTAL	**4787**	**1260**	**26.32**	**27.9%**

The above table shows the average 27.9 % harvest of rainwater from rooftops, resulting in more than 70% of rooftops wasted as runoff every year. This is due to the fact that storage facilities are deficient in the household. The backward economy cannot afford to buy rainwater storage structures and storage facilities. On the other side, the insignificant collection of rainwater is due to ignorance and negligence of the importance of rainwater harvesting.

1.5.2. Spring Water Harvesting

Springs are underground water that emerges at the surface in the form of a seepage conduit. The shallow groundwater emerges from the porous bed. In search of water, the traditional practices of clearing the point where zones of porous bed shallow area show the sign of water availability. They dig the area to unearth the water in a small pond system. Many spring sources are located in the study area.

In the study area, settlements are located along the catchment boundary, so it is more feasible to utilize spring water sources than river water. More than 30% of household water consumption is estimated to be met from spring water during dry season.

Table 2: Springs in the study area. Source: Author.

Sl.No	Village	Perennial Spring	Seasonal Spring	Total
1	Seling	7	5	12
2.	Thingsulthliah	8	6	14
3.	Phulmawi	4	4	8
4.	Khumtung	5	7	12
5.	Baktawng	4	7	11
6.	Chawilung	3	4	7
7.	Lamchhip	5	3	8
8.	Kelsih	5	4	9
9.	Aibawk	4	5	9
10.	Thiak	4	3	7
11.	Hualnghmun	4	6	11
12.	Muthi	5	7	11
13.	Sesawng	6	6	12
	TOTAL	64	67	131

Many springs water are identified in the study area, more than half of them are seasonal, normally available during monsoon season and dried up during dry season.

1.5.3. Water Harvesting from Rivers and Streams.

The study area is characterized by sharp structural hills with v-shape valleys and steep slopes. Rivers and streams flow at lower altitudes, thus, it is impossible to utilize for settlements located at the higher ridges. River water is traditionally channelized and collected using bamboo line by means of gravity for farm consumption. Irrigation practices are minimal in the study area even in the lower river banks. Nowadays, by government initiatives under PHED river water is hauled using power pumps for domestic consumption.

1.6. Management of Traditional Water Harvesting Systems

Water is the most important natural resources that needed to manage and conserve, not only because of the economy but due to the fact that proper exploitation of renewable resources is the key factor for the existence of human kind in the earth. Many push factors resulted in to increase in the consumption of water resources. Exploitation of water resources including groundwater extraction is severe in many places of the world. Till today, the traditional method of water harvesting is prevalent and it is the method of environmentally friendly and does not affect the ecological balance. In the study area of the upper Tuirial Watershed, the traditional method of rainwater harvesting especially rooftop rainwater harvesting is the common technique used by the majority of the household. The field survey also opined that, referring to the annual rainfall of the area, the rooftop water harvesting alone can meet the domestic demand of the area.

Spring-shed management is hailed as one of the key objectives in the State Action Plan on Climate Change (SAPCC) and State Water Policy of Mizoram. It aims at participatory spring-shed revival to promote sustainable and equitable management of groundwater resources with the overall goal of dealing with water scarcity. The programme has worked with welfare schemes such as Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) and National Rural Drinking Water Programme (NRDWP). Construction of a spring shed and revival of old and abandoned spring source that are perennial in many places of the study area is identified. Construction of farm ponds and water storage structures for both agricultural fields and household use is also an ongoing program taken out and monitored by the district administration through MNREGA, Dept. of Irrigation, IWDP, and Agriculture Dept. etc. in the whole region. Conservation of vegetation at the upper area of the source region is the most common practice for harvesting optimum water availability in the area.The tribal farmers of the region have developed a system for irrigation in which water from perennial springs is diverted to the terrace fields using varying sizes and shapes of bamboo pipes. Best suited for crops requiring less water, the system ensures that small drops of water are delivered directly to the roots of the plants. These ecologically safe traditional systems are viable and cost-effective alternatives to rejuvenate depleted water resources. Productively combining these structures with modern rainwater-saving techniques could be the answer to perennial water woes.

1.7. Conclusion and Suggestion

The traditional water harvesting systems carry a combination of disciplines including culture, tradition, climate, and forest, land, and water engineering that can help manage water sustainably. The study area experienced high precipitation available only for a few months of the year and only a small portion is stored naturally. This is where managing rainwater in upland areas becomes important for maintaining both green and blue water sources. Study on water sources can help us understand the limitations of the area-specific water cycle and its components and help us identify sustainable ways to manage water. The lack of water exploitation in the lower river banks is mainly due to communication and technological problems in addition to a lack of financial assistance.

From the above discussion, it may be suggested that:

a) Traditional Method of Water Harvesting is still practiced in the area.

d) Only 27.9 % of households in the study area practice rainwater harvesting.

e) Rooftop rainwater harvesting is usually practiced partially in one-sided roofs only. Which is supposed to be ¼ (one-fourth) of the total roof area.

f) Awareness regarding the importance of water harvesting, rainfall structure, climate, and their implication in the area. importance of water harvesting etc.

g) It is opined that the development of a traditional method of rooftop rainwater harvesting alone will solve the scarcity of water in the study area.

h) it concluded that rainwater harvesting is the only technique used in the area, while government supply is greatly relied on by the household.

i) The development of channel irrigation for agriculture and fish ponds in the lower river bank will enhance the potential of water available in the area.

k) development of rooftop and sprig water renovation will solve more than 60% of the scarcity of population in the area.

b) Development projects are introduced in order to provide an adequate supply of water under different projects.

1.8. Acknowledgement

This article is presented for the partial fulfilment of the thesis title ‘Assessment of Water Resources Potential and Its Management in Upper Tuirial Watershed, Mizoram’ by the author.

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